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Specifications for a new water supply for Jersey City have been adopted by the Board of Street and Water Commissioners in accordance with the recommendations of Mayor Wanser, as outlined in our issue of Jan. 10. If the Finance Board approves the specifications, it is probable that bids will be received on March 25 on four different plans, as follows: (1) A supply delivered by pumping to the Belleville Reservoir, 157 ft. above high tide, with alternate bids for two 25,000,000 or one 50,000,000-gallon supply main and with a 20-ft. right of way; also a 60,000,000-gallon pumping plant, 3,000,000,000 gallons of storage capacity and a supply main (48-in.?) from the Belleville to the high-service reservoir. The contractor must maintain for emergency use the present main pumping plant for three years. (2) A gravity supply to the Belleville Reservoir, with the same provisions as to head, supply mains to and from Belleville and storage. (3) A gravity supply for the whole city, part (or all?) to be delivered at the high-service reservoir, 210 ft. above mean high tide, and general provisions as in (2) and (3). (4) The remaining plan is for filtered water, evidently for the filtration of the present supply, and for the main already mentioned to the high-service reservoir. Under all the plans the city is to have the right to buy the plant at any time within 20 years; the plant must be located in New Jersey and no other customer may be served from it; the water must be of a purity to conform with a standard laid down by Prof. Peter T. Austin, of Brooklyn, and need not be paid for when it falls below such a standard. The city is to take at least 20,000,000 gallons of water per day, but 50,000,000 gallons must be provided and the prices for these and intermediate quantities must be stated. Mr. John H. McArthur is president, Mr. Geo. T. Bouton is clerk and Mr. W. W. Buggies is chief engineer of the Board of Street and Water Commissioners. The board is composed of five members, but certain of its proposed acts must be approved by the Finance Board before they can be performed.

The site of the proposed Diamond Shoal lighthouse, off Cape Hatteras, is being examined by Capt. John Millis, Engineer Secretary of the Lighthouse Board. Last fall a temporary structure was erected upon these shoals to test the shifting nature and general characteristics of the sands. The foundation of this structure, though also temporary, has so far withstood the winter's storms, and seems to demonstrate that a lighthouse can be successfully founded at this point.

The originality of the Greathead system of tunnelling is being questioned in the correspondence of the London "Times." The basis of opposition to his claims is seemingly the Brunel tunnel under the Thames, of 1825. But Mr. R. Price-Williams writes that the first successful tunnelling through loose, water-bearing strata by means of compressed air was undoubtedly that performed by Mr. Greathead on the City & South London Ry. The success of this work depended upon a combination of compressed air, shield, cast iron tunnel and grouting by compressed air. It is undoubtedly true that in the 76 years that had elapsed since the elder Brunel took out his patent no engineer had succeeded as Mr. Greathead did in similar work; though tunnels are now being driven by methods similar to his in France and elsewhere. In connection with Marc Isambard Brune, the elder, few engineers remember that he was a resident of the United States for some years before he went to England to become famous as an engineer. He fled from France, for political reasons, in 1793, and came to New York. He surveyed and explored lands on Lake Ontario; made surveys and plans for the Champlain canal; made a design for the National Capitol at Washington; designed and built the old Bowery Theater in New York, and practiced as an engineer and architect in New York until 1799, when he settled in England.

The most serious railway accident of the week was a double rear collision of the three sections of a coal train on the Buffalo, Rochester & Pittsburg R. R., near Carmen, Pa., Jan. 22. The collisions occurred on a bridge ,and several cars went over the structure. The wreck was burned. One man was killed and four men were injured.——A freight train on the New York & New England R. R. ran into an open draw at the Fort Point channel, Boston, Mass., Jan. 15, and the engineman was killed. After the last passenger train for the night had passed, the draw tender started to open the bridge, having first, as he claims, set the signals at danger. Before the bridge was half opened a switching engine with seven cars came down the track, and the engine, tender and three cars ran into the opening. In some of the press accounts the yard men are reported as saying that the signals were set, but that it is customary for enginemen to run down close to the draw before stopping.

The single cable of a workmen's elevator in the Webster Ave. (Long Island City) shaft of the East River Gas Co.'s tunnel, between Brooklyn and New York city, broke Jan. 17 while four men and a load of bricks were being lowered. Three of the men received injuries which are likely to prove fatal. The shaft is 140 ft. deep.

Two collisions on the Brooklyn Bridge cable railway on the evening of Jan. 21 blocked traffic for a considerable time. The first occurred in the New York station, a switch engine being run against the end of a train to which it was to be coupled with such force as to derail the front truck of the car. In consequence of this the running of trains from the Brooklyn end was stopped, and the crowded incoming trains at that end were switched out into the yards, causing some delay. One incoming train was stopped by the block signal on the approach, and owing to the fog and the steam from the elevated railway engines underneath, it was run into by the following train, and two or three persons were cut by broken glass. When this track had been cleared, shuttle trains were run over it by two locomotives until the derailed car in the New York station had been removed.

The falsework of a new bridge being erected over the Monongahela River at Homestead, Pa., was blown down by a heavy wind Jan. 15, and a number of workmen were thrown to the ground, a distance of 30 ft. One man was killed, one fatally injured, another seriously hurt, and several badly bruised.

The Mississippi River steamer "State of Missouri" was sunk Jan. 19 near Alton, Ind., and between 30 and 40 persons were drowned. The swift current at the narrows made steering difficult, and the boat swung around so that the stern hit a rock, which smashed a large hole in the hull, and in a few minutes the vessel broke up and sank. Only two boats were got off. The vessel was a sternwheel steamer running between Cincinnati and New Orleans.

A boiler explosion occurred Jan. 16 in one of the Carnegie mills at Homestead, Pa., by which two men were killed and two injured. The accident is attributed to the use of muddy river water and the clogging of the feed pipe inlet by sediment.

The results of the terrible explosions at Butte, Mont., recorded last week, are reported as 53 persons killed, 85 persons injured and financial losses amounting to $100,000.

An explosion in the corning mill of the powder works of the Laflin & Rand Co., near Newburg, N. Y., occurred Jan. 19, and one man was killed.

The Diglake colliery at Hanley, England, was flooded Jan. 14, when 240 men were in the mine, and 100 lives are reported as having been lost.

The work of removing the Buffalo grade-crossings is to be commenced soon by the New York Central R. R. Company, says a Buffalo item. Plans have been prepared by Chief Engineer Katte, and it is expected that the contracts will be let by Feb. 1. The controversy over the grade crossings of the Erie, Lake Shore and other roads is not yet disposed of.

The Connecticut grade crossing bill was signed by the governor Jan. 22, and becomes operative immediately. It is very brief. The first section provides that no electric, cable or horse railway shall hereafter be constructed across the tracks of any steam railway at grade; and no steam railway shall hereafter be constructed across the tracks of any electric, cable or horse railway at grade. At Bridgeport, Conn., the court has refused to dissolve the injunction restraining the Bridgeport Traction Co. from crossing the New York, New Haven & Hartford R. R., and the latter road has secured an injunction restraining the former from laying its tracks across the land owned by the railway company.

An ordinance requiring the St. Charles Air Line R. R. in Chicago to elevate its tracks will soon be presented to the City Council for adoption, according to newspaper reports. This road crosses the city from east to west on about the line of 16th St., and is used by the Chicago & Northwestern, Chicago, Burlington & Quincy; Illinois Central and Michigan Central railways. Owing to the different interests involved, there has been considerable delay in arranging matters so as to satisfy both the railways and the city; but it is now announced that the railway officials have signified their willingness to adopt the city's plans in their general features. The principal question involved is the arrangement of the crossing with the Chicago & South Side Rapid Transit Co.'s elevated railway. The people interested in the St. Charles Air Line desire a further elevation of the elevated railway tracks, and this seems likely to cause trouble. Just what the character and design of the work will be cannot be told until the ordinance is presented.

The issue of $4,000,000 of bonds by the Sanitary District of Chicago has been sold to the New York Life Insurance Co., of New York city, on its bid of 0.51% premium for 4½% bonds, payable in currency. Bids were called for on 4½% and 5% interest, payable in gold and in currency, and the following are the names of the bidders and the prices offered by each:

	Gold 5%.	Currency 5%.	Gold 4½%.	Currency 4½%.
Ill. Trust and Sav. Bk.	101.375	.....	.....	.....
*Mason, Lewis & Co.	101.53	.....	.....	.....
E. H. Gay & Co.	102.04	.....	.....	.....
N. W. Harris & Co.	105.833	102.775	101.333	100.316
**State S. B., St. Paul.	104.125	104.125	100.375	100.375
J. & W. Seligman.	104.38	103.67	101.33	100.39
N. Y. Life Ins. Co.	104.58	103.65	101.31	100.51
Farson, Leach & Co.	104.66	.....	.....	.....

*For $500,000. **For $25,000.

The bid of the New York Life Insurance Co. was the highest unconditional bid for the whole issue, with interest and principal payable in currency, and it was considered advisable by the Trustees to accept this bid rather than to reverse its adopted policy of issuing currency bonds, for the sake of the very small increased premium which was bid for gold bonds. The total amount of premium at the price for which the bonds were sold will be $20,000, which will reduce the actual interest rate from 4% to 4.435%. The purchaser will take the first half of the bonds Feb. 5, and the second half Feb. 15. It is understood that the successful bidder and Messrs. J. & W. Seligman are in a combination to divide the bonds equally. The sale of these bonds brings the total bond issue of the Sanitary District up to $12,000,000.

THE PUGET SOUND DRY-DOCK, PORT ORCHARD, WASHINGTON.

(With Inset.)

In our issue of May 19, 1892, we gave full details of this dock as then projected upon plans and specifications prepared by Mr. M. T. Endicott, C. E., U. S. N., of the Bureau of Yards and Docks. This dock is now nearing completion, and to the courtesy of Commodore E. O. Matthews, Chief of the Bureau of Yards and Docks, we are indebted for the photographs here reproduced, showing the progress of the work, and for some further detail as to minor changes in plan, recommended by a board of engineers, made up of Messrs. P. C. Asserson, F. C. Prindle and A. G. Menocal, all Civil Engineers of the United States Navy and members of the American Society of Civil Engineers.

Our previous description of this dock is correct for the dock as built, except that the dock has been lengthened 50 ft., to better accommodate the large express steamers, which in case of war may be brought into the government service. The dimensions of the caisson-gate have also been changed somewhat from those already given, and would now read as follows:

Length over all at top of water ways	91 ft. 10⅝ ins.
Extreme molded breadth	24 ft.
Molded breadth at top	13 ft.
Extreme height	38 ft. 11¼ ins.

The two concrete-stone-faced wing-walls, at the entrance to the dock, are also to be eventually extended to a length of 500 ft., with a distance of 180 ft. between them, thus forming a slip for vessels entering or leaving the dock.

The dimensions of the principal timbers actually used in construction are as follows: The longitudinal caps on the piles, 12 × 12 ins., secured by ⅞-in. drift-bolts, driven 12 ins. into the piles. Crossing these caps are 14 × 16-in. transverse timbers, each 72 ft. long, extending clear across the dock. The piles supporting the inclined sides of the dock are capped by 10 × 14-in. sticks butting against the transverse floor-timbers. The alters are made of 11 × 11-in. sticks, secured to these inclined caps. As a further means of keeping out the water, a row of sheet-piling was driven around the floor of the dock and 5 to 6 ft. into the undisturbed soil, and rising 10 ft. above the floor and behind the side slopes of the dock. Outside the outer row of piling another row of sheet-piling was driven, as shown on the cross-section illustrated in 1892. Back of the altar-braces is 3 ft. of puddle clay well rammed in.

The drainage plan has been somewhat modified from that before described and is now stated to be as follows: Resting upon the natural soil, under the timber grillage surmounting the piles, is a network of square wooden box-drains, leading to a central 12-ft. circular brick culvert, emptying into the sump in the pump-house. Above this system of drains is a bed of Portland cement concrete, nowhere less than 3 ft. thick, and in this concrete are surface drains, 6 ft. wide, leading to the cross-drains and culvert described. The floor runs lengthwise of the dock and is made of 3 × 12-in. plank laid with ½-in. spaces between them, to allow the water ready entrance to the drains beneath.

At the risk of some repetition, and for the benefit of some engineers, the operation of the caisson-gate is here described in some further detail. This caisson is a double-ended hull, built entirely of steel, provided with an upper deck of wood and a main and lower deck of steel; and there are also two sets of transverse beams without decks. Running the entire length of the side of the keel and the two similar ends, are two steel 5 × 4½-in. angles, spaced 10 ins. apart and holding between them a 6 × 10-in creosoted packing-timber; and secured to this timber by copper nails is a rubber packing-piece, oval on top and having a base of 6 ins. When in position this packing is pressed against the stone sill, provided for it at the dock entrance, by the pressure of the water from without when the dock itself is empty.

As before described, this caisson is provided with twelve 20-in. filling culverts, passing through it and controlled by gates on the main deck. There is also between the main and lower deck a water-chamber, with two 20-in. sluices, one connecting with the sea and the other with the dock and also controlled by valves on the main deck. Through cement and pig-iron ballast provided, the caisson can be floated about, like a vessel, and manoeuvred by a capstan on the upper deck. When the ship is in the dock and the gate is to be closed, preparatory to emptying the dock, this caisson is floated in position across the entrance, and when in place it is sunk to a bearing by admitting water to the water-chamber, and the entrance is made water-tight, as the dock itself is emptied by the pumping plant. When the ship is to be taken out of the dock, this latter is filled through the twelve 20-in. filling culverts in the caisson; and, when full, the caisson is lifted from its bearing by pumping out the water in the water-chamber, a small engine boiler and a centrifugal pump capable of delivering 2,500 gallons per minute being stationed for this purpose on the main deck of the caisson. When the caisson is thus floated, it can be swung out of the way. The same engine operates the capstan on the upper deck. The dock, when full, contains about 13,000,000 gallons of water, and with the pumping plant provided, it can be emptied in about two hours.

The contract for building this dock was let, on Oct. 29, 1892, to Byron Barlow & Co., of Tacoma, Wash., for $491,465, to be completed in 36 months. Work was commenced on Dec. 10, 1892. By a supplemental contract of March 15, 1893, the dock was to be lengthened 50 ft for an extra sum of $23,771, and an extension of 3½ months in the time of completion. In July, 1893, the board of engineers recommended some slight modification in the foundation at the entrance to the dock, and it was also decided to build the approach wing-walls at the entrance. For these the contractors were allowed an additional sum of $69,546, and an extension of four months in time. Including some other small extras allowed, the cost of the dock complete will thus be $607,951.64, and the total time for the completion is 43½ months. The indications now are that the dock will be finished by Aug. 1, 1895, or nearly one year ahead of the contract allowance. Mr. F. C. Prindle, C. E., U. S. N., is the Engineer in direct charge of construction.

When finished this dock will be the largest in America; two Italian docks, only, exceeding it in size anywhere. The Mare Island dock, at San Francisco, is only 513 ft. long and 79 ft. wide, with 27½ ft. of water over the sill; and the English Esquimault dock, at Victoria, is only 450 ft. long. In our issue of Dec. 20, the principal dimensions of all the U. S. government docks are given, and in this list comes the new dock now under construction at the Brooklyn Navy Yard. While this latter dock will be longer by 20 ft. than the Puget Sound dock, it will have 28 ft., instead of 30 ft., of water over the sill at ordinary high-water.

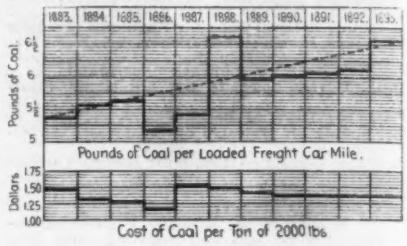
COAL CONSUMPTION OF FREIGHT LOCOMOTIVES; C., B. & Q. R. R.

In a paper on the heat value of Western coal for locomotive fuel, read before the Western Railway Club Dec. 15 by Mr. W. Forsyth, reference was made to an attempted investigation of the progress made in fuel economy with respect to boiler construction, firebox, grate and draft appliances, and methods of firing. It was found difficult, however, and in some cases impossible, to get the exact figures necessary for such comparison, as few railways weigh the coal put on the tenders or the weight of the cars, and coal consumption in pounds per car-mile or miles per ton of coal cannot be used for exact comparisons. When roads adopt a train rating by tons, instead of by cars, a closer approximation can be made to the actual work done, as the records will then show coal used per ton-mile, especially if scales are put in at coaling stations and the coal weighed onto the tender. Failing this comparison of the results on different roads, however, Mr. Forsyth presented a diagram showing the cost of coal per ton and the coal consumption per loaded freight car-mile on the Chicago, Burlington & Quincy R. R., during the ten years 1883-93. The cost of the coal varied from $1.20 to $1.50 per ton, averaging nearly $1.37, the price being lower in 1893 than in 1883. The consumption, per loaded car-mile, has increased 18% in the 10 years, one reason for which may be the increase in weight of cars during that period.

The following is an abstract of Mr. Forsyth's statement:

The pounds of coal consumed per car-mile have increased gradually in a decade from 5½ lbs. to 6½ lbs. or 18%. This would seem to indicate that larger grates, fireboxes and boilers, straight stacks, and other changes made since 1883, have increased the coal consumption per unit, instead of diminishing it. But in a comparison of the performance of our Class A, with 17-in. cylinders, and Class H mogul engines, in freight service on our Galesburg Division, it is found that the latter haul a loaded car with much less coal than the former. The grate surface of the A engines is 17.6 sq. ft., and of the H, 27 sq. ft., and the fireboxes are larger in proportion, the A having a deep box between the frames, and the H, a Belpaire box above the frames.

In freight service 40 H engines averaged 16.64 miles per ton of coal, and the A engines, 20.39 miles, the showing on this basis being best for the A engines. But by obtaining a closer approximation to the actual work done, and expressing it in pounds of coal per loaded freight car, we find the H engines average 4.61 lbs. coal per loaded freight car-mile, and the A engines, 6.32, a difference of 37% in favor of the larger engines. The variation in performance of different engines of the same class in the same service is shown by the maximum and minimum figures in the list from which the above averages were taken. For the A engines the maximum is 9.66 and the minimum 4.62 lbs. per loaded car-mile, a variation of more than 100%, while for the H engines the maximum is 6.81 and the minimum 4.06 lbs., a variation of nearly 60%.



Diagrams of Fuel Consumption of Locomotives; C., B. & Q. R. R.

Our compound H engine in the same service shows a much less coal consumption than any others, it being only 3.27 lbs. per loaded freight car-mile. A Class A engine with Belpaire boiler, in the same service, shows 4.36 lbs. coal per car-mile, being less than any other A engines.

All the equipment of the C., B. & Q. system in 1883 had small fireboxes, 17 sq. ft. grate, and less, excepting 27 consolidations, having 27½ sq. ft. of grate. In 1893 we had increased the equipment by the addition of 100 engines having large fireboxes, and 27 sq. ft. grate. In 1883 the average grate area per engine was 16.37 sq. ft., and in 1893 it was 18.95 sq. ft., an increase of 15.7%. With the addition of 100 large locomotives to an equipment of 446 small ones, we should expect a very material improvement in the fuel economy, but the records as now kept show for the whole road an increase of 18% in pounds of coal per loaded car-mile in ten years.

A NOVEL SWINGING FOOT BRIDGE.

We illustrate herewith a novel swing span used as a temporary foot bridge during repairs to a highway swing span over Mission Creek Channel at the Fourth St. crossing in San Francisco. During repairs to the turn-table of the highway bridge the span was swung open and jacked up on a falsework in that position. This left the channel open for vessels, but of course blocked it for foot traffic, and it was finally decided to build a fixed span across one-half of the channel and a swing span across the other half, with the highway bridge serving as a center pier. This allowed of both the street and river traffic being accommodated. The general view, Fig. 1, shows clearly this swinging foot-bridge, and its position with respect to the metal swing span under repair.

The construction of this temporary swing span is shown in Fig. 2. The bridge consisted of two trusses 62 ft. long, with bottom chords made of single timbers of that length. For a pivot pier a pile 100 ft. long was driven, and left with the top 40 ft. above the wharf. This pile was guyed in three directions, the back guy being provided with a turnbuckle for adjustment. The foot of the pile was braced against the adjacent wharf. The top of the pile was bound with an iron ring and a 2½-

in. pin 4 ft. long was sunk into the pile 2½ ft. Around this pin a swivel was placed, which was held up from the top of the pile by rings oiled to move easily on one another. To the swivel was fastened the ropes supporting the outer end of the bridge. The guy lines were fastened above the swivel in the manner shown. A short piece of 3-in. gas-pipe was fitted into a cap and also into a collar, as shown. A wrought iron ring rested on the collar, and the guy lines were looped over the

Fig. 1. View of Swinging Foot Bridge Used During Repairs to Fourth St. Swing Bridge, San Francisco, Cal.

pin and rested on the ring, being thus held up from the swivel. Lines also supported the end of the bridge which butted against the pile. Rollers were fastened to the base of the pile upon which the bridge turned, the timber at the end being cut semi-circular and protected with a ¼-in. plate bent to fit. The span was erected on the adjacent wharf and carried into place by a pile driver. The outer end rested on the sidewalk of the draw span.

When driving the pivot pile, the top was inclined out into the stream 2 ft. and was braced that way. A man on shore drew the bridge open with a windlass, and on account of the inclination of the pile, raised it at the outer end after the manner of a swinging gate. When it was necessary to close the bridge the windlass man let go, and the bridge returned by gravity to the first position. In order to partially take the strain off the supporting cables a lever was provided to raise the end of the swinging span. This lever was an 8×8-in. timber, 16 ft. long, the top of which was planed and greased and one end blocked up 12 ins. above the other. When the swinging bridge returned from the shore, the velocity was just sufficient to make it run well up on to the greased surface. The lower end of the lever was then raised by a small hand lever, thus giving the span a firm bearing. The cables which held the outer end of the span were fastened to eyebolts which passed through a timber placed below the lower chord. These eye-bolts were threaded for 18 ins. and allowed for the adjustment of the end of the bridge. This bridge worked perfectly from the first turn, being used three weeks, while the repairs to the turn-table were in progress.

For the information from which the above description was prepared and the drawings accompanying this article, we are indebted to Mr. J. D. Galloway, engineer for the firm of Healy, Tibbitts & Co., of San Francisco, contractors for the repairs to the bridge.

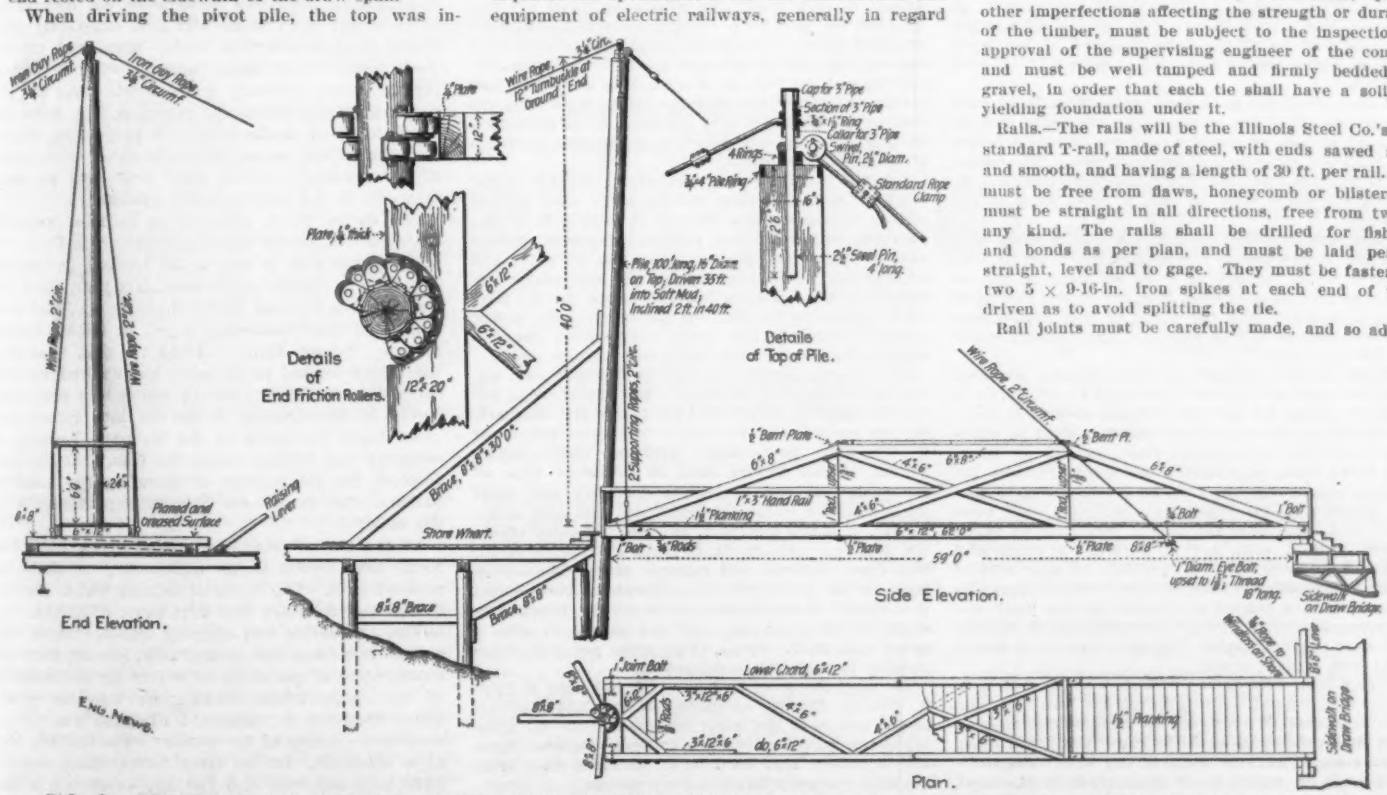


FIG. 2. GENERAL PLAN AND DETAILS OF SWINGING FOOT BRIDGE, USED DURING REPAIRS TO FOURTH ST. SWING BRIDGE, SAN FRANCISCO, CAL. Healy, Tibbits & Co., Contractors; J. D. Galloway, Engineer.

SPECIFICATIONS FOR ELECTRIC RAILWAY CONSTRUCTION.

With the steady and rapid growth of the electric railway, especially in the direction of suburban and country communications, their construction and management are coming to be an important field of engineering, and a very large number of engineers, who were employed on steam railway construction during the boom years, from 1887 to 1890, are now engaged in electric railway work. In building a horse railway for a small town or suburb, where speed was slow and cheapness was the first essential, an engineer was rarely employed, but with electric lines running heavy cars at high speed more careful construction and supervision are required, to ensure safety and economy in operation, especially where sharp curves are met with (Eng. News, May 10, 1894). We have received several inquiries for specifications for the construction and equipment of electric railways, generally in regard to comparatively small lines, and we present this week the specifications for the Waukesha Beach Electric Railway, at Waukesha, Wis., for which we are indebted to Mr. Wm. Powrie, of Waukesha, the Chief Engineer. We have omitted the general requirements as to the contract, and have also slightly condensed the specifications. It is specified that all work must be done to the approval of the supervising engineer of the railway company, and all patented apparatus and material must be furnished by the contractor under guarantee against loss through suits for royalties or claims of any kind. The specifications are as follows:

The road is to consist of 5½ miles of single track, standard gage, with three crossovers and double track sufficient for convenient switching. The overhead line is to be supported on the side-pole system, with curves, switches, etc. The feeder system is to maintain a maximum drop not to exceed 10% under full load. Cars, motors and other apparatus for the operation of the road, exclusive of the power-house equipment, are to be provided.

Ballasting and Leveling.—The road must be well ballasted with coarse gravel level with top of ties, 6 ins. deep underneath the ties, and brought to a grade, according to grade stakes furnished by the supervising engineer of the company. The track must be brought to alinement by tamping well under each and every tie, giving a solid foundation before any filling is done.

At cross-roads, or where village grades are established, they must be strictly adhered to, subject to the inspection and approval of the village engineer or inspector. At all curves the outer rail must be raised as specified in curve plan, so that the necessary high speed may be attainable with safety, and special care must be taken to have crves well tamped while ballasting or filling between the ties.

Wherever marsh or soft ground is encountered, a substructure of broken stone or other suitable material must be built, so that a safe and reliable foundation is furnished before the ties are tamped or any leveling is attempted. Special care must be exercised by the contractor in ballasting and leveling that a perfect alinement is secured.

Ties.—The ties, except those for switches and curves, must be of sound, white, clear cedar, with two well-leveled surfaces, not less than 7 ft. long, 7 ins. face and 6 ins. deep. They must be spaced 2 ft. c. to c., except at joints, where they must be not more than 6 ins. apart. At curves or crossovers the ties must be of white or burr oak, 8 ft. long, 6 ins. deep and 8 ins. face. These must be spaced 24 ins. c. to c. from the point of switch to a distance of 4 ft. from outer end of frog.

Ties must be free from rot, worm holes, splits or other imperfections affecting the strength or durability of the timber, must be subject to the inspection and approval of the supervising engineer of the company, and must be well tamped and firmly bedded with gravel, in order that each tie shall have a solid, unyielding foundation under it.

Rails.—The rails will be the Illinois Steel Co.'s 56-lb. standard T-rail, made of steel, with ends sawed square and smooth, and having a length of 30 ft. per rail. They must be free from flaws, honeycomb or blisters, and must be straight in all directions, free from twist of any kind. The rails shall be drilled for fishplates and bonds as per plan, and must be laid perfectly straight, level and to gage. They must be fastened by two 5 × 9-16-in. iron spikes at each end of tie, so driven as to avoid splitting the tie.

Rail joints must be carefully made, and so adjusted that the rail ends are not closer together than 1-16 in., nor further apart than ¼ in. Fishplates must be of the standard pattern made for this particular rail, and bolted up, using thoroughly reliable lock nuts; the same to be driven home with a hammer while the nut is being drawn up. This operation must be gone through twice on every joint. Special care is to be taken in laying curves, which must be placed accurately to plan, and spikes must be so driven that they will not draw, from strain on the rail. This work

must be done subject to the most rigid inspection and approval of the supervising engineer, from whom all sights and centers can be obtained.

Special Work.—The special work shall consist of three turnouts, and such curves and switches as may be necessary to run cars into the car house, or at the terminals. This work must be done in a thoroughly reliable manner, and none but first-class workmanship will be accepted.

All switches, turnouts, crossovers, station tracks, terminal tracks, etc., must be built of the standard rail, and must correspond in character with the track specified for the general line, and as little cast iron used as is consistent with first-class construction. All surfaces subject to wear must be of steel. Switch tongues must be of standard length and size.

The gage of the track shall be 4 ft. 8½ ins., and the gage of turnouts, switches, etc., shall be so full as to insure the operation of motors and trucks easily at high speed.

Bonding.—At each joint the rail must be bonded by two 0000 B. & S. copper rail bonds of a length of 6½ ins. between centers. These bonds must be securely riveted into each side of the lower flange of the rail, the hole in rail to be countersunk from top side and to be brightened before the bond is driven in. The bond must have a solid shoulder against which to rivet. This work must be done in a careful and accurate manner, so that an absolutely perfect contact shall be obtained from the bond. Each bond and rivet head must after being placed be painted with a coating of black asphalt. The bonds must be so placed that the fishplates can be displaced without interfering with bonds.

Cattleguards.—Wherever, as shown upon the plans, by reason of farm and highway crossings, cattleguards or cattlepasses shall be required, the contractor shall furnish the same of the best standard make, together with ties of sufficient length for the proper placing of same.

Pole Line.—Side poles for span wire construction are to be used throughout, except in such places as it may be found impracticable to set a pole at each side of the roadway, in which case a pole with a single bracket arm is to be used. All poles shall consist of carefully-selected white cedar timber, straight and trimmed round. They must be not less than 7 ins. diameter at the top, which must be roofed or pointed. The height of pole shall be 20 ft. above the level of the track line, and each pole is to be set at least 6 ft. in solid ground.

Where filling has been done, poles must be of such length that they can be set to the full depth of 6 ft. in solid ground, as specified, and yet rise to a height of 20 ft. above the level of the track line. They must be placed not less than 100 ft. or more than 125 ft. apart, and there must be used at least 90 poles per mile.

Poles must be set in line, with a rake or inclination in opposite direction to strain of 18 ins. in 20 ft. The hole in which the pole is to be set must be dug as small as possible consistent with the proper placing of pole as specified, and the filling so well packed that the pole shall be able to withstand any ordinary strain on the span wire.

Where marshy ground is encountered, such provision must be made and material furnished as will secure a reliable setting for the pole. Cement or broken stone, if required by the supervising engineer, shall be requisite under this latter specification, and, if necessary, guy stays must be provided. All poles necessary for curves or anchor poles, must be set according to plan or direction of the supervising engineer. All poles shall be painted with one coat of lead color oil paint. Where bracket arms are to be used, a substantial wrought iron arm shall be furnished. A span wire of ¼-in. galvanized steel wire shall be stretched from pole to pole, with a ratchet at one end so that slack can be taken up readily. This ratchet shall be of the best and most approved make. The span wire to be drawn tight with a slight strain.

Trolley Line.—The trolley wire shall be No. 0 B. & S. hard-drawn copper, in lengths of not less than one mile, and must be supported on straight line hangers with either Medbury, Aetna or Johns insulation, using 15-in. soldered ears to support the wire. The overhead work on curves to be constructed in the most approved manner, using 9-in. slips with improved pull-offs for all spans.

All switches to be of the most improved plan and so adjusted as to allow the trolley wheel to follow accurately.

Strain pull-offs are to be placed at intervals not exceeding one mile, by which the line must be anchored in both directions. The ends of the line must be securely anchored through reliable strain insulators. Standard splicing ears must be used to connect the ends of the wires, and the joints must be well soldered. This work must withstand an insulation test of not less than one megohm per mile.

Feeders.—Provided the power house is placed at a distance not exceeding 2,000 ft. from the terminus of the line, two feeders are to be provided for carrying the current from the power house to the line. These must have weatherproof insulation and be placed on feed-wire insulators and supported by two pin-oak cross arms securely bolted to the side poles. There will be three feed wires of No. 0000 B. & S. gage. One feed wire will be 10,000 ft. long and of an area of 4.0 circular mills, and tap at the end through a feeder ear to the trolley wire. The second feeder must be 20,000 ft. long and of an area of 4.0 circular mills, and the third 30,000 ft. long, tapped at the end through a feeder ear to the trolley wire. These feeders shall be put up in a substantial and reliable manner in accordance with the best electrical practice. All joints must be well soldered.

The feeders are to be protected by a water lightning arrester at the power house end, and no fewer than five non-arcing lightning arresters are to be placed along the line at intervals of one mile. These arresters must be securely fastened to the poles, and connected with No. 6 insulated wire from the rail for the ground connection and a No. 6 insulated wire from a feeder ear on the trolley wire for the current connection.

Cars.—The contractor shall furnish two closed motor cars, 25 ft. long in the body, 33 ft. long over all, and 7 ft. 10 ins. wide, with a seating capacity for 44 people, and an approximate weight of body of about 7,000 lbs. Also one closed motor car, 34 ft. long over all, and 7 ft. 4 ins. wide, with seating capacity for 44 persons, and weight of about 4,500 lbs. Also three open cars for use as trailers, having a width of 6 ft. 10 ins., a total length of 34 ft., and having twelve seats, with capacity for 60 persons, and weighing about 6,500 lbs. These cars are to be furnished with monitor roofs, full line ventilators, fare registers, mirrors, gongs, radial drawbars, ratchet brake handles, sand boxes, bumpers, commodious seats, etc., and shall be trimmed and finished in such style and with such appurtenances, carpets and trimmings, as shall be required by the railway company. The painting and lettering of cars shall be as directed by the railway company.

Trucks.—There shall be furnished for each of the closed 25-ft. motor cars two pivotal trucks, with four wheels to each truck; the wheels to weigh not less than 300 lbs. each. The truck must be furnished with standard brakes, and with proper method of suspension motors. The wheels for said trucks to be 36 ins. diameter, and all four so connected as to receive uniformly the power transmitted to their axles from the motor. All wheels of said trucks to be of same size. Each truck shall be furnished with improved brake appliances and life guards.

For the 16-ft. closed motor car, a standard motor truck of some first-class reliable make shall be furnished, having a wheel base of at least 6 ft. 6 ins., provided with equalizing springs, lifeguards, adjustable brake system, journal boxes and all parts and adjustments in consonance with the best truck construction. For the three 34-ft. trail cars, pivotal four-wheel plain trucks shall be furnished, with proper springs, lifeguards and brake attachments, designed especially to secure easy riding and noiseless action.

Motors.—The motar cars shall be equipped with motors as follows: The two eight-wheel, double-truck motor cars shall be furnished with two 30-HP. single-reduction motors, and the one four-wheeled motor car (closed) shall be furnished with two 15-HP. single motors. These motors shall be furnished with all the equipment and appliances necessary and usual for a complete motor equipment and use upon a motor car, including controller, switches, lightning arresters, fuse box, light circuit, etc., and all must be of the best known material and standard make. The motors must be of the latest style, either of the General Electric Co. or the Westinghouse railway types, with single-reduction gearing, and guaranteed to give a speed with 36-in. wheels of 35 miles per hour when running to their full horse-power.

The controller must be that which is known as Type K, General Electric controller, or standard Westinghouse, and be of the latest improved form. All other apparatus, such as switches, trolleys, contacts, lightning arresters, etc., must be of standard make from the same company furnishing the motors.

Ten lights are to be placed on each motor car, two four-light clusters inside the car, placed on suitable fixtures, and one light on each platform, to be controlled on a five-light circuit by two snap switches. The trail cars must also have light fixtures the same as the motor cars, with connections so arranged as to take light from the motor cars.

Tests.—All work shall be regularly and systematically tested while in process of construction, and any defects found shall be immediately remedied. The final test shall be made in the presence of the supervising engineer or his representative, and the right is reserved by the railway company in case any doubt arises as to the fulfillment of the true spirit and intent of these specifications, to demand a test by expert engineers selected as is usual in matters of arbitration, whose decision shall be final on all disputed points, the expense of such tests to be borne equally by both parties, unless the apparatus or material shall prove defective, in which case the contractor shall bear the expense and shall also remedy the defects, and he shall also be liable for any damage or loss to the said railway company resulting from conditions incident to the remedying of such defects.

During the progress of the work, it shall be subject to the inspection of the supervising engineer or of his representative. The railway company will assume no liability nor responsibility for any part of the installation until formally accepted in writing, and no part will be accepted until the company is satisfied that it fully complied with the spirit and intent of the specifications. The acceptance of any portion of the work shall not be construed as a final acceptance, and the failure of any part to perform its proper function shall be sufficient grounds for the rejection of the whole.

The final acceptance shall be given only after the completion of the work contemplated under the specifications according to their true spirit and intent, and after the final test as specified. Such acceptance, however, shall not prejudice any claim which the railway company may have for the replacement of defective material for the time specified. The date of the completion of the final test shall be taken as the date of such final acceptance, provided such test proves satisfactory.

THE LUEHRIG GAS-MOTOR, FOR STREET RAILWAYS.*

By Frederick A. Kummer.

The use of electricity as a motive power upon our urban and suburban railways has been so successful, and its adoption into popular favor so very rapid, that all other systems of street railway locomotion have been left far in the rear. In the more conservative countries of Europe this has not been the case. Less ready to accept new ideas, the inhabitants of European cities have not decided in favor of any one system—and then completely gridironed their streets with trolley wires and tracks. As a result of this more cautious policy—a policy, perhaps, more necessary where 5-cent fares are not universally charged—more attention has been devoted to other methods of car propulsion, which methods, it was hoped, would do away with many of the defects, including great first cost, so characteristic of the electric trolley system.

The device which promises to be most successful, as a rival to the trolley system—or, in fact, any other system now in use—is the Luehrig gas-motor, first tried in the city of Dresden, last year, upon the tracks of the German Street Railway Co., and running from the Neustaedter depot, in Grossenhainer St., to "Wilder Mann." Upon its first trial trip the motor worked fairly well, but showed several small defects, the removal of which was necessary before an introduction of the car into actual service. Upon the death of the inventor, Luehrig, a company was formed, called the Gas Traction Co., Limited, for the purpose of operating the Luehrig patents and the several English improvements of the same.

At the second trial, the motor, in an improved form, gave results highly satisfactory to those interested in it. The essential defects which showed themselves upon the first trip were, first, that the motion at starting and stopping was not as smooth and as free from jars as desirable; second, that the consumption of gas made necessary by the running of the engine during short stops was too great. There was also an unpleasant vibration due to the continued running of the engine while the car was at a standstill. In the later forms, these defects have been removed, and the car, as shown in the illustration, is not so clumsy in general appearance as when it first appeared.

Its weight, complete, is 5½ tons; length of body, exclusive of platforms, is 3.5 meters. There are 14 seats inside, 12 upon the deck, and standing room for, perhaps, 10 persons, giving a maximum capacity of 36 persons. The gage is 1.435 meters, and the general arrangements do not differ from those of other cars in use upon the line. The motor,

* Further particulars as to experience with this motor will be found in our issues of May 3, June 7 and Oct. 18, 1894.

M, is a 10-HP. Otto gas motor, with two cylinders, C_1 and C_2, which are arranged under one of the seats parallel to one of the long sides of the car. They are coupled directly to the shaft W, which carries the flywheel, S, and lies between them. The ignition of gas is accomplished by means of an electric spark, but the noise of the explosion is too slight to be noticeable. The gas is carried in three cylindrical gas tanks, two of which, B_1 and B_2, are situated across the bottom of the car, near the front and rear platforms. The third tank, B_3, is placed under the seats opposite to the engine. The capacity of the three tanks is 0.95 cubic meter, and they together weigh 250 Kg. The water required to cool the cylinders circulates automatically in copper coils, winding from the bottom of the car to the roof. The heated water mounts to the deck, becomes cool, and descends again to the cylinders.

motion of the latter. It is to avoid this continual starting that the flywheel and engines are run continuously throughout the entire trip. This starting of the flywheel is accomplished by fitting a crank to the exposed end of the flywheel shaft.

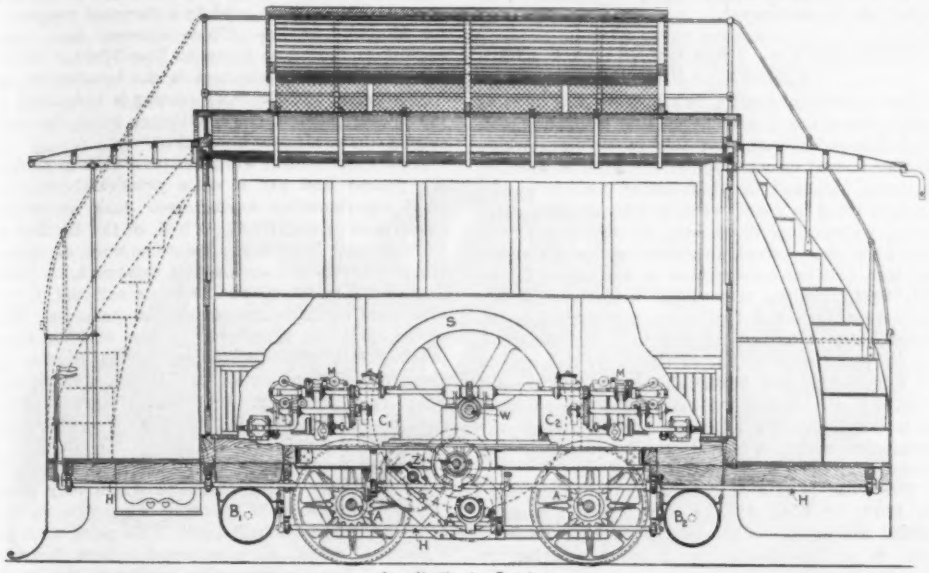
The consumption of gas during stop is small, the number of revolutions being decreased. On the platform of the motor car are two levers, controlled by the motorman, and a crank which operates the brake. One of the two levers controls the friction coupling and governs the speed and stopping of the car. The other reverses the engines when necessary. These levers are removed from one platform to the other—when direction of the car is reversed, at the end of a trip.

In order to facilitate the turning of very sharp curves, only one wheel upon each axle, the one upon the same side as the engines, is tight upon the axle, once transferred to the car tanks by attaching to them a rubber connecting pipe, the operation requiring about half a minute.

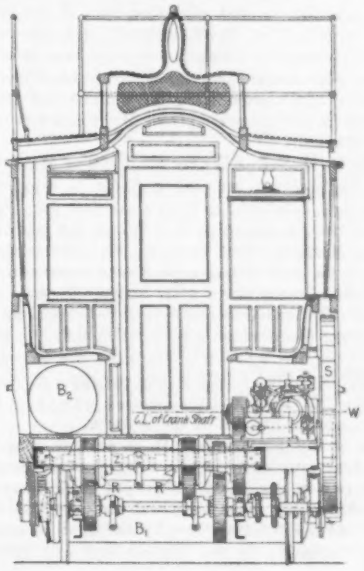
From time to time the water in the cooling pipes must be renewed to supply losses. In winter the addition of a small quantity of glycerine prevents freezing. Such cars as described could be built at a cost of 15,000 marks (about $3,750) each.

Judging from the use which this type of motor has had in the city of Dresden, in Dessau, and in West Croydon, near London, England, repairs are infrequent and slight, while in every respect they were satisfactory.

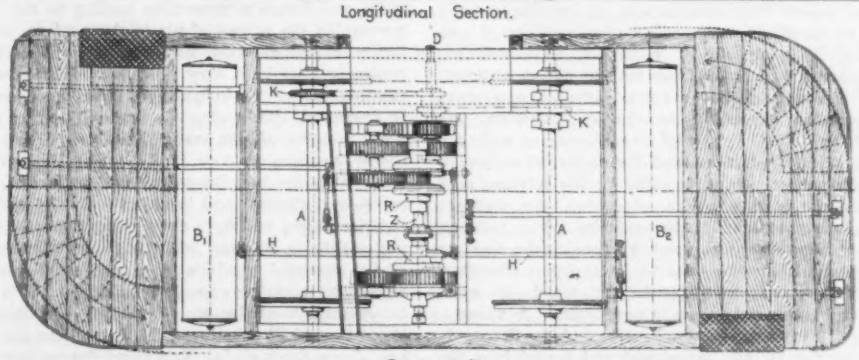
The English Traction Syndicate, Ltd., has perfected an improved form of the Luehrig motor, in which the flywheel is in a horizontal plane, and the engine condensed in size and so attached to the running gear that the truck forms a separate carriage,



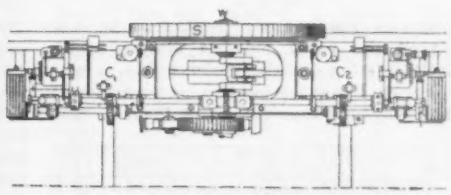
Longitudinal Section.



Transverse Section.



Sectional Plan.



Part Plan Showing Motor.

THE LUHRIG GAS MOTOR CAR FOR STREET RAILWAYS.

These coils are concealed in the woodwork of the car. The ends of the gas reservoirs are also concealed by sheets of perforated zinc.

No part of the machinery is visible from the interior of the car, nor is the least noise or odor of gas perceptible. Provision is made for a proper inspection of all parts of the machinery, by means of trap-doors. It will readily be seen that the arrangement of the engines and the one gas tank, B_2, balances the weight of parts properly.

The power from the engines is transferred from the flywheel shaft, W, to an intermediate shaft, Z, by cogged gearing. A lever, controlled by the motorman, operates an ingenious friction coupling, throwing into gear the main axles, and giving an increasing or diminishing speed—as desired. Upon stopping the car, this intermediate shaft, Z, still revolves, but is thrown out of connection with the main axles. The shaft, Z, is geared to two auxiliary axles, and from the second of these, D, sprocket chains conduct the power to the main axles at K, K_1. The joint bolts of these chains are covered with cylindrical steel cases, loosely fitting so as to reduce friction.

When the car is started, the flywheel of the engines must be turned by hand, so as to start the other wheel having a freedom of movement of 80% of the circumference of the axle. The sharpest curve upon the line over which the trial was made had a radius of 15 m., and no trouble was experienced in rounding it, although a speed of 14 kilometers per hour was maintained (8.7 miles).

The consumption of gas was about 1-3 cu. m. per car-kilometer, which, at a cost of 3 cts. per cu. m., gives a cost per car-kilometer of 1 ct. This is equivalent to a little less than 2 cts. per car-mile, at a cost of 80 cts. per 1,000 cu. ft. of gas.

The gas is carried in Pintsch tanks, at a pressure of 6 atmospheres. Consumption of gas is readily seen by inspection of a pressure gage provided. The capacity of the tanks being together .95 cu. m., the car carries sufficient gas for $\frac{6 \times .95}{\frac{1}{3}} = 17.1$ car-kilometers. In issuing from the tanks, the gas passes into a Pintsch pressure regulator, where its tension is reduced to a pressure of 35 mm. water column. This allows of the use of practically the entire contents of the tanks.

The filling of the gas tanks is done at a station equipped for that purpose. The gas is compressed in large storage reservoirs by pump, and is at

to which the body of any ordinary horse, cable, or electric car may be bolted, thus saving all of the old equipment but the running gear. This new American model will be brought to this country in a short time, with a view to its general introduction here.

THE MARLBOROUGH SEWERAGE ASSESSMENT PLAN.

The city council of Marlborough, Mass., adopted on Jan. 4 a new plan for meeting the cost of constructing and maintaining its sewerage system, including the sewage filtration beds. The system was completed and put in operation in 1892. Under the plan adopted the cost of operation and repairs, plus the interest on the bonds issued to pay for the system and the yearly contribution to the sinking fund, is divided equally between the general tax levy and the rentals to be paid by "every person or owner of an estate who enters his particular sewer into the common sewer." The rentals are to be established annually by the city council and are to be based upon the water consumption. If they yield insufficient revenue in any year to make up the required one-half, then the deficiency is to be raised by general taxation. The annual rentals are to be collected by the collector of taxes. The yearly

rentals have not yet been fixed, but it is expected that they will be established soon. The plan is in conformity with certain permissive state legislation (Sec. 109 of Chap. 245 of the Acts of 1892), the Massachusetts Legislature having laid down a choice of plans for making sewerage assessments.

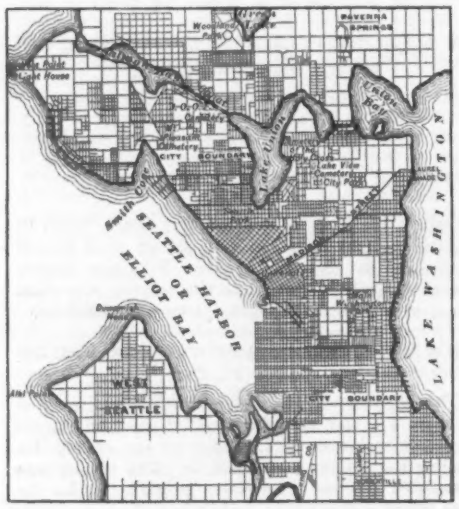
In our issue of July 19, 1894, we reviewed editorially an elaborate report on sewer assessments made by Mr. F. H. Snow, City Engineer of Brockton, Mass. In this report Mr. Snow devised a sewer assessment plan which was adopted by Brockton and discussed in the article named. At Brockton the scheme is designed to assess the tax on account of the sewers, with the nearest approach possible to absolute equity. One-fourth of the money to be raised is assessed in the general tax levy, one-fourth on the property actually benefited and one-half is collected as rental charges. Here, as at Marlborough, the amount of water used is the basis of the rental. The direct property assessment is a combination of a frontage and area tax, in order to avoid the inequalities resulting from either plan alone, which inequalities, as well as the inconsistencies in various other plans, Mr. Snow has pointed out at length.

Mr. B. R. Felton is City Engineer of Marlborough and to him we are indebted for a copy of the ordinance establishing this plan, and for other information on the subject. When the matter was under discussion last summer, Mr. Felton then informed us that it was proposed to cover the whole cost of the main sewer after leaving the city streets and of the disposal works by general taxation. After deducting the amount already paid into the sinking fund from the balance of the cost, the city was to assume one-third of the yearly expenses for interest and sinking fund, and the balance was to be raised by rentals for the use of the sewers.

Under the rental plan, it is evident that those who first connect with the sewers, being comparatively few in most cities, must pay a high rental, or else the rental must be based on possible connections and the deficiency met by taxation, as seems to be the intention in the Marlborough and Brockton plans.

THE SEATTLE-LAKE WASHINGTON SHIP-CANAL.

As Congress has seriously considered the construction of this canal and has already appropriated $25,000 for dredging Salmon Bay, a part of the project, the exact location and purpose of this proposed waterway will be of interest. The



Map Showing Location of Proposed Lake Washington Ship Canal.

canal is planned to connect the waters of Puget Sound and Lake Washington, which forms the eastern boundary of the city of Seattle. This lake is about 20 miles long, averages 2½ miles wide and has an area of 24,896 acres (38.9 sq. miles). Over 22,000 acres of this area the water is 25 ft. or more in depth. In the deepest parts of the lake, soundings of 600 ft. have been obtained.

As indicated on the accompanying map, for which we are indebted to the "Seattle Post-Intelligencer," the actual canal work required is only a few hundred feet between Union Bay and Lake Union, and 5,700 ft, between Lake Union and Salmon Bay, an estuary of Puget Sound. No full estimate of cost has yet been presented.

The purpose of the canal is to afford a fresh-water harbor which would much decrease the danger to docks, etc., from the torpedo, and vastly extend the docking facilities of Seattle, and also to furnish a fresh-water basin for vessels of war on the Pacific station, and for all other ships requiring cleaning of barnacles, etc. At the present stage of proceedings, a company has been formed for its construction, and it is stated that arrangements have been completed by which St. Louis capitalists agree to take the company's bonds to the amount of $5,000,000, provided right-of-way is secured and a tidal lock is constructed.

FIREPROOFING PROCESSES AND FIREPROOFING PAINTS.

An important feature in methods for insuring safety from fire is that of making wood fireproof, and this is important not only in buildings where timber is used in construction, but even in so-called fireproof buildings, in which latter there is usually enough wood in doors, window frames, office partitions, wainscoting, floors, etc., to sustain a serious fire when once started, as pointed out in the article on high building construction, in our issue of Dec. 27, 1894. Various methods of fireproofing timber have been devised and patented, many of them impracticable, on account of their injury to the wood, or for other reasons, but in the "Electric" system of fireproofing, now being introduced, it is claimed that, while rendering the timber uninflammable, it does not injuriously affect its quality, but at the same time makes it harder and free from liability to decay or the attacks of worms.

The wood is treated with a compound patented in 1893, by Lina Schuler (No. 502,867; Aug. 8, 1893), the patent being assigned to Max Bachert, who is putting the invention on the market, as noted below. The composition, as described in the patent specifications, consists of phosphate of ammonia and sulphate of ammonia, to which anhydrous chloride of calcium may be added, although this is not essential in most cases. The average proportions, according to the specifications, are three parts by weight of the phosphate and one part of the sulphate, and for fireproofing woven fabrics, paper, etc., one pound of this mixture may be dissolved in a gallon of water, the material being then steeped in the solution. For treating timber the patent recommends exposing the wood to the steam from the solution in a closed chamber, but in the present plant the wood is more thoroughly treated in an iron cylinder. A vacuum is first created to extract the sap, and the fireproofing solution is then introduced and forced into the wood under a pressure of about 100 lbs. per sq. in., the pressure varying with the closeness of fiber of different woods. The chemicals fill and solidify in the cells of the wood. Except for a slight darkening, the appearance of the timber is not affected, and its "life" is not injured.

The timber thus treated will not flame or sustain combustion. When subjected to intense heat, it is charred and carbonized where the flame strikes, but flame will not travel along it, although under similar circumstances untreated timber will catch fire and be in a blaze immediately. The process is somewhat expensive, but not materially so, when the safety and the possible reduction in insurance are taken into account. Not only is the process suitable for heavy construction timber for mills and other buildings, roofs, floors, etc., but also for fire doors, lathing, wainscoting, moldings, doors, shutters, paneling, etc., in which latter forms it is specially suitable for the interior work of office and bank buildings.

A small square building, constructed with the treated timber, was tested by the Board of Building Commissioners, of New York city, on Jan. 5, to ascertain the truth of the claims made for the process. The building had floor, walls, roof, lathing, wainscoting, door, fire-shutters and chimney, all of the timber, and was raised from the ground on four posts. Fires of pine sticks were lighted at two opposite sides, the fires being right against the bottom beams. The wood only charred, however, and even the open shutters, enveloped in flame, did not take fire, but were slowly charred away. A pile of oil-soaked wood in the building was then lighted, and for more than an hour the light structure was subjected to intense heat and flame, the walls and roof slowly charring into holes and dropping away piecemeal. Such a structure of untreated wood would have been entirely destroyed in a very short time.

The solution is used in the manufacture of fireproof paint, either as oil paint for exterior work or water paint for interior work, the latter being known as "ivory coating," and these paints have already been taken up by F. O. Pierce & Co., paint manufacturers, of New York city. The solution is also used for fireproofing canvas and other textile material, and in a fireproof compound for laundry purposes. These processes have been applied to theatrical scenery. The Waldorf Hotel uses the fireproof compound in the laundry for its lace curtains, and the ivory coating is to be used in the Weber piano factory, although other fire precautions have already been taken.

Much experimental work has been done to perfect the process and put it on a practical basis, the chief experimenting having been done under the supervision of Mr. D. W. O'Neil, of the Bradley & Currier Co., New York, manufacturers of doors, window sashes and ornamental woodwork. A plant is now in operation, and is being enlarged to increase its capacity for commercial purposes. The system is being introduced by the Electric Fireproofing Co., whose offices are in the Bradley & Currier Building, corner of Hudson and Spring Sts., New York city. President, George C. Currier; Vice-President, Max Bachert; Secretary and Treasurer, John J. Hughes.

Another fireproofing process, which has recently come into some prominence and which may properly be referred to in the same connection, is the Jamieson "fire-resisting" paint. This paint contains a chemical which, when subjected to heat, fuses or melts and forms a protective coating to the wood, preventing the access of air to the surface, so that the wood cannot flame or blaze, but will only carbonize or char by a slow process of destructive distillation, under the influence of great heat, until it is destroyed. This effect is limited to the immediate vicinity of the external source of heat, and ceases as soon as this is removed. The paint is made with the best linseed oil and pigments, in all colors and shades, and is suitable for interior and exterior work, and it is claimed that the fire-resisting quality is obtained without the sacrifice of any of the essential qualities of a good paint, such as durability, covering capacity, finish, etc. This paint is manufactured by the Jamieson Fire-Resisting Paint Co., of Elizabethport, N. J., and the company has also a fire-resisting kalsomine, for coating rough interior surfaces, being a water-wash used like lime-wash, and specially adapted for woodwork not exposed to actual rubbing contact, such as floor beams, lathing, sheathing, etc. A roofing paint is also made, which may be used for exterior work, such as wooden and canvas roofs, bridges and trestles, farm buildings, fences, etc. This paint has been used in the Metropolitan Museum of Art, New York, and the Corcoran Building, Washington, D. C., the Grand Central Palace, New York, and a number of manufacturing and mercantile establishments.

RIGID OR FLEXIBLE WHEEL-BASE FOR STREET CARS.

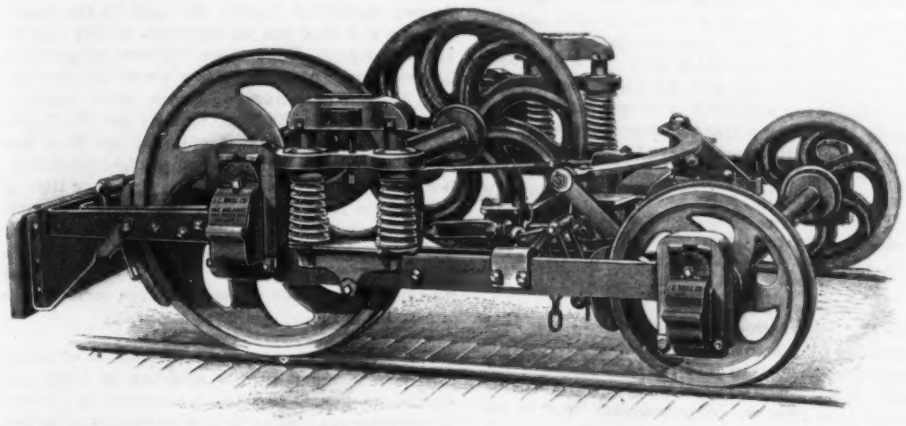
Until the application of electric and cable traction to street railways, and the consequent increase in weight and speed of cars, street cars were almost invariably carried on four wheels, with a short and rigid wheel base, an arrangement which with horse cars longer than the average, gave rise to a severe fore and aft rocking motion of the car, unpleasant for the passengers and injurious to the track. Soon after the general introduction of electric traction, there was a decided move in favor of longer cars carried on two four-wheel pivoting trucks, like ordinary passenger cars, but in many cases these were found to be unsatisfactory, and attempts were then made to extend the spring base of the car

frame, as shown in an issue of Nov. 29, 1894. A form of truck, however, which has been found very satisfactory for eight-wheel cars is that of which the J. G. Brill Co., of Philadelphia, Pa., makes a specialty, and which has one pair of large wheels (on whose axle the motor is mounted) and one pair of small rear wheels, so that the swiveling of the truck does not interfere with the car sills. All the wheels have brakeshoes. We give below an abstract of an article by Mr. John A. Brill, in the "Street Railway Journal," in regard to this question, and the accompanying cut is reproduced from an illustration in that paper:

Many different types of eight-wheeled cars have been, in the last few years, brought to the notice of the street railway fraternity through tests made in different cities, and the early ones to which I will refer have, without a single exception, to my knowledge, been failures of a dismal kind. The double truck cars operated by the Duquesne Traction Co., of Pittsburg, were handsome and elaborate cars, built by a well-known maker and mounted on pivotal trucks whose wheels were all of the same diameter and pivotal point at the direct center, so that the car body, to admit curving, had to be elevated sufficiently to permit the truck to radiate clear of the car frame, such elevation necessitating two steps, which was a manifest disadvantage. One motor was used on each truck, but the grades were so great (9 to 10%) that the tractive force of the trucks (which, as only one pair of wheels act as drivers, amounted to only 50% of the weight of the vehicle) would not permit the motors to render anything like their normal service, and the cars were nearly every time stuck on the hills, and, as a consequence, could not be run profitably. The failure in this case has been attributed to the motors, but it was, unquestionably, the severe combination of inadequate adhesive weight on unusually heavy grades.

The West End Street Ry. Co., of Boston, tested many styles of double-truck cars, notably 25 ft. bodies, built almost as heavy as a passenger coach, and mounted on trucks generally similar to those tried by the Duquesne Traction Co., which the latter afterwards discarded. In some cases two motors were mounted on a single truck, the other truck being a trail truck, and in other cases one motor was mounted on each truck. In either case there would be developed, at best, but 50% of the tractive force of the motors, relatively to the weight of the car, and the vehicles were so high above the rails, to admit of the trucks radiating on curves, that condemnation was almost immediately pronounced by a large majority of the patrons. Another type of car was then tried, on the same general style of heavy construction, but lower on the trucks. To accomplish this end, the bodies were built somewhat wider at the sills, allowing room for the wheels of the pivotal trucks to radiate between the sills. This style of construction was, in weight, something far beyond expectation, and required so much energy that another failure was the result.

The general disposition of managers of electric roads is to put cars with 20 or 22-ft. bodies, and 28 to 30 ft. long over all, on single or four-wheel trucks. Long cars mounted on four-wheeled trucks, while they possess advantages, as regards traction on extra heavy grades, over those mounted on center pivotal trucks, as before described, are extremely expensive to keep up. In the first place, no matter how superior the roadbed construction may have been when laid, it could not have been mathematically perfect. A long car mounted on four-wheeled trucks is bound to gather at times an oscillating or pitching motion. A moderately-extended spring base has an effect of mitigating this oscillation to passengers, but the pounding on the roadbed is greatly increased by the pitching on the short-wheel base and cannot be overcome. The result is that for every jump of the car the roadbed suffers. On all tracks there are places, besides the curves, at which one rail is elevated above the other. The long spread of a truck with 6 or 7 ft. wheel base, as compared with "maximum traction" trucks having wheel base of 3½ to 4 ft., takes in a large amount of this difference in elevation, and exaggerates the distortion from parallelism of the driving axles and motors. It thus causes a binding of gear wheels, as well as a more rapid wearing away of the cogs, and retards the movement of the motors, thus causing far more strain on the main electric outfit. In my judgment, cars with 18 ft. bodies are the longest that should be used on four wheels. Longer cars should be mounted on "maximum traction" trucks, so as to overcome all oscillation and the objectionable pounding referred to above. The recent inventions in this style of truck, and from which it derives its name, provide for 87% of the weight on the driving wheels and the remaining 13% on the trail wheels, just sufficient on the latter to keep them on the track should slight obstructions be encountered. The trail wheels being small and the pivotal center of the truck being within the periphery of the driving wheels, in passing around curves the driving wheels radiate within the car bottom, while the trail wheels radiate entirely beneath the car body, with the bottom frame not exceeding 6 ft. 2 ins. for a standard gage track. The height from under side of sill to line of rail is as low as 27¼ ins., being ½-in. lower than on regular four-wheeled cars.



MAXIMUM TRACTION TRUCK FOR EIGHT-WHEEL STREET CARS; J. G. Brill Co., Philadelphia, Pa.

Another advantage consists in the facility for repairing a damaged motor. One end of the car body can be jacked up and the single motor and truck run out for repairs, by merely disconnecting the motor leads. If the damage is of a permanent nature, the truck and motor can be replaced by another in a very short space of time.

A controversy arose between the New Orleans Traction Co. and the Electric Power Co. furnishing power for the cars. The latter claimed the cars were exceptonally heavy, larger than the ordinary, and, having eight wheels, consequently required more power. The result of this controversy was the appointment of a commission consisting of W. H. Knight, engineer of the railway department of the General Electric Co.; J. B. Craven, engineer of the Louisiana Electric Light Co.; and B. Willard, engineer of the New Orleans Traction Co., who were requested to make exhaustive tests and investigate carefully. They reported that it took no more power to haul the double truck car than the single truck car.

PROPOSED REORGANIZATION OF THE CORPS OF CIVIL ENGINEERS, U. S. NAVY.

The Hon. A. C. Durborrow, Jr., Member of the 53d Congress from Chicago, Ill., has introduced into the House the following bill for reorganizing the Corps of Civil Engineers of the U. S. Navy. We have commented upon it elsewhere. The bill provides:

Be it enacted, etc., That from and after the passage of this act the active list of officers in the Corps of Civil Engineers shall consist of 14 civil engineers and 8 assistant civil engineers, as follows: Two civil engineers with the rank of captain, 3 civil engineers with the rank of commander, 4 civil engineers with the rank of lieutenant-commander, 5 civil engineers with the rank of lieutenant, 4 assistant civil engineers with the rank of lieutenant, junior grade, and 4 assistant civil engineers with the rank of ensign.

Sec. 2. That all vacancies in the grade of civil engineer shall be filled by promotion from the grade of assistant civil engineer, established by this act, according to seniority, after a physical examination by a board of surgeons in the Navy, and a mental and professional examination by a board of civil engineers in the Navy; Provided, That assistant civil engineers shall not be eligible for promotion to the grade of civil engineer until after three years' service in the grade of assistant civil engineer. And provided further, That vacancies occurring in the grade of civil engineer with rank of lieutenant before assistant civil engineers shall become available for promotion thereto under this section shall be filled by appointment from civil life, after successfully passing such examinations.

Sec. 3. That from and after the passage of this act there shall be selected by the Secretary of the Navy, annually for two years, four cadets who have passed the requisite academic course of four years at the Naval Academy, from those who show an aptitude and preference for the profession of civil engineering, to whom the Secretary of the Navy shall afford all proper facilities for pursuing and completing a course in civil engineering in some educational institution in the United States of good repute, properly authorized to confer the degree of civil engineer; and any vacancies that may occur in the grade of assistant civil engineers, as established by this act, shall be filled by selection from Naval cadets from time to time, as such vacancies occur, in the same manner.

Sec. 4. That Naval cadets selected for the Corps of Civil Engineers shall, upon final graduation, be commissioned as assistant civil engineers.

Sec. 5. That the active list of officers of the Civil Engineer Corps of the Navy shall receive the pay per annum now provided by law: Provided, That after 20 years from the date of appointment civil engineers shall receive, when on duty, $4,000, and when on leave or waiting orders, $3,000. Assistant civil engineers shall receive during the first five years after date of appointment, when on duty, $1,400; on leave or waiting orders, $1,000; during the second five years after such date, when on duty, $1,700; on leave or waiting orders, $1,200; after 10 years from such date, when on duty, $2,000; on leave or waiting orders, $1,400.

Sec. 6. That the Chief of the Bureau of Yards and Docks shall be a skillful and experienced civil engineer, selected from the list of officers of the Civil Engineer Corps of the Navy, not below the rank of commander, and shall have the title of director-general of public works, and the relative rank of commodore while holding such position.

Sec. 7. That any and all acts and parts of acts inconsistent with this act are hereby repealed: Provided, That nothing in this act shall be construed to give officers in the Corps of Civil Engineers of the Navy the right to exercise military commands other than in their own corps.

A bureau of electricity is proposed at Buffalo, N. Y., to have general supervision of all matters pertaining to the distribution of electric currents in the city. The matter has assumed new importance with the application for a franchise made by the Niagara Power Co., and the city council has passed a resolution requesting the Board of Public works to consider the establishment of such a bureau.

A track torpedo device for use in protecting the rear of trains without sending back flagmen was tried recently on the Staten Island Rapid Transit Ry. A small carriage running on the rail is propelled by means of a burning rocket, the fire of which cannot be extinguished by rain or wind. Under favorable conditions the carriage will run about 3,000 ft. before stopping. In case of the wreck or stalling of a train the brakeman puts the carriage on the track and lights the torch by means of a friction cap.

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The thesis awarded first Honorable Mention in our thesis competition of 1894, entitled "The Friction of Wood Upon Wood at High Pressures, and Its Application to the Design of Timber Joints," proves to have been the work of Messrs. Edwin H. Messiter, Elizabeth, N. J., and Richard C. Hanson, New York City, graduates of the Columbia College School of Mines.

Following close on the announcement of the award of the contract to the Pencoyd Iron Works for the superstructure of the great cantilever bridge which is to span the East River at Blackwell's Island, comes the call for plans for a new St. Lawrence River bridge at Montreal, with a single span of 1,250 ft., and two approach spans of 500 ft. each. With the viaduct approaches on each side, the total length of the bridge will be nearly two miles, and its length of span will make it rank second only to the Forth bridge, among the great truss bridges of the world. The general invitation to bridge builders and engineers to submit designs will afford an opportunity for an international competition of great interest.

Nothing seems to upset so completely some of the good people and enterprising newspapers of Brooklyn than the possibility of the extension of the meter system in that city. One of the latest editorial utterances of the Brooklyn "Eagle" on this subject contains the following:

> Water in the city should be like bread at home. No mother cares how much bread her child eats except as it may hurt the child. The thought of economizing on bread is about the last thing that would occur to any one.

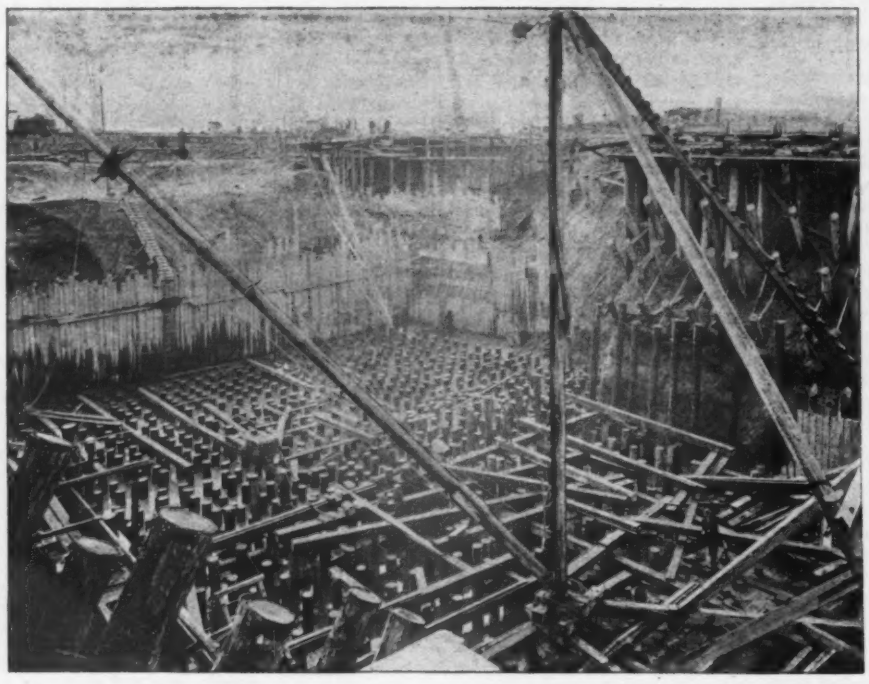
Our opinion of the mothers of Brooklyn will fall by at least one-half if it turns out that they make no distinction between eating and wasting bread. It is not the free and liberal use of water that is responsible for the high consumption in so many cities, but the criminal wastefulness that is constantly going on. Coming back to the bread argument again, the bakers of Brooklyn are not furnishing the mothers of that city with bread at a lump sum per child, but very rigidly insist on a certain sum for each loaf; nor do they furnish all loaves at the same price, regardless of size.

The prospects for a pure water supply for Jersey City will be brighter than for some time past if bids are finally asked on the specifications outlined elsewhere in this issue. Some of the specifications under which bids have before been called for are claimed to have been drawn in the interest of certain prospective bidders; but these latest specifications seem to be honestly planned to secure competition from all possible sources, and to bring out such a variety of bids as will enable the city to select and carry out the best scheme. The greatest element of uncertainty seems to be the strength of the corporations which have for some years past left no stone unturned to gain control of all the valuable water supplies suitable for Jersey City and other municipalities in the vicinity. But if Jersey City is making an honest effort to secure a good supply at the lowest possible figures, and if the manufacturers of mechanical filters and the contractors who are in a position to build sand filter beds, see and improve their opportunity, it is quite likely that the possibilities of filtering the present supply may bring the big water corporations down to a reasonable basis. Much can be said against using the Passaic River water for very many years more, even if carefully filtered; but so far as purity alone is concerned, filtration could be made to effect nearly 100% improvement in the quality of the present supply. Therefore, if naturally pure supplies cannot now be secured at a reasonable price, a well-filtered supply would do very well for a few more years while efforts are continued to secure legislation to properly adjust the water rights in the state. The present specifications may prove to be so wide that there will be a sharp competition between the owners of naturally pure sources of supply. In any event, the opportunity here afforded those interested in filtration is an excellent one, and one which deserves careful study and close estimates.

Bill No. 8482, introduced into the House of Representatives by Congressman Durborrow, has for its purpose the reorganization of the Corps of Civil Engineers of the Navy. It is framed upon altogether different lines from the bill commented upon in our issue of Sept. 6, 1894, and is much more in accordance with the dictates of common-sense and the actual needs of the government in its corps of naval civil engineers. The notable feature in the new bill, elsewhere given in full, is that, instead of requiring that the Chief of the Bureau of Yards and Docks shall be "a line officer not below the rank of commander," the new bill demands that this chief of a civil engineering bureau shall himself be "a skillful and experienced civil engineer," selected from the list of the officers of the Corps of Civil Engineers, "not below the rank of commander." The arguments in favor of the proposed radical innovation in the head of this bureau are so self-evident that no further remarks are needed, except to wonder at the tradition that has so long made this bureau so different in the requirements for its chief from all other bureaus in the Navy Department. It may also be said that the powerful line influence will be wielded to defeat this bill in the interest of retaining for that branch of the service a comfortable sinecure which it has held so long that the proposed change can only be looked upon by the line officers as an outrageous attack upon long-established precedent and right by possession. It is a significant fact, in this connection, that in the many meetings of the Congressional special committee on the personnel of the U. S. Navy, every branch of the service was accorded a hearing, and all just claims were recognized in the proposed reorganization scheme—except in the case of the Corps of Civil Engineers. In the framing of all previous bills the rights of the engineers were persistently ignored, and the officers of the corps were not consulted. All proposed legislation in their case was at least instigated by line officers, who were men ignorant of the duties of, or requirements for, engineers; and one of the results of this presumptuous meddling with matters they did not understand was the utterly absurd bill commented upon by us last September. Mr. Durborrow's bill is the first one presented that puts the interest of the government above the selfish aims of individuals. It properly demands that an expert should head this bureau, as is the case now in all the other bureaus of the Navy Department, and its prompt passage would be a benefit to the government and remove a source of irritation, and of possible danger, in the conduct of the naval engineering work of the government.

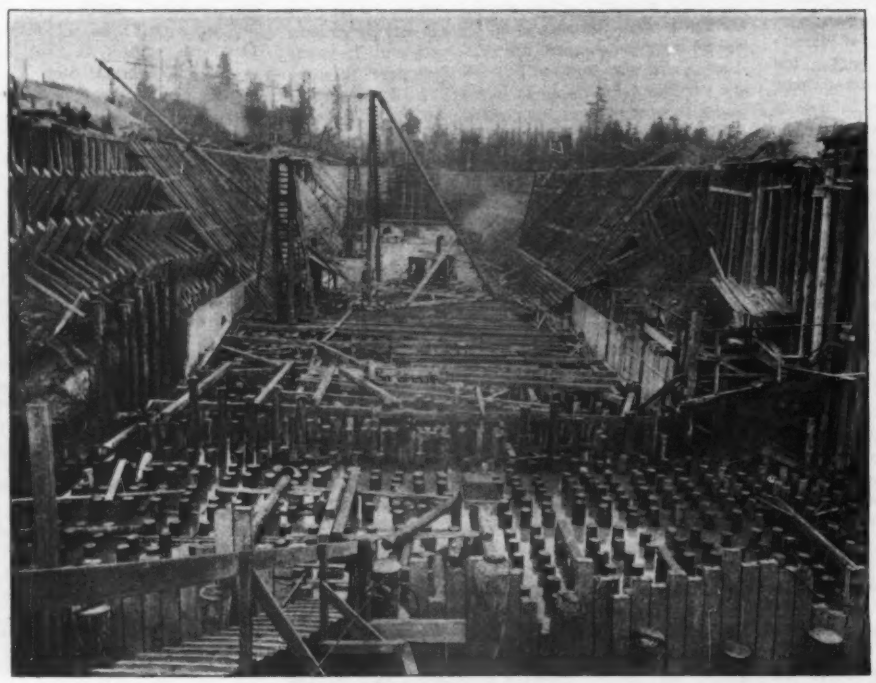
The transfer of cotton manufacturing from New England to the South is assuming considerable importance. Some of the largest mill corporations of Lowell are petitioning the Massachusetts legislature for authority to increase their capital stock, for the purpose of erecting new mills in the Southern states. The Jackson & Nashua Mfg. Co., of Nashua, N. H., is making a similar request of the New Hampshire legislature. According to the officers of these corporations, this move is made because the coarser grades of cotton goods can now be manufactured more cheaply in the South than in New England. The Southern mills save the freight on the raw cotton, being able to buy it at their doors and in such quantities and quality as they choose. Water power is abundant, and cheap coal makes steam power inexpensive, while the milder climate lessens the cost of heating during the winter months. Labor is abundant, low-priced and tractable, and absence of factory legislation enables the mills to run longer hours, which they can do, moreover, at less cost for artificial light. Thus these Northern corporations believe they can make greater profits by transferring their manufacture of coarse grade goods to Southern mills, while their mills in the North will be devoted to the manufacture of the finer and more costly goods, in which more highly-skilled labor is essential. It will doubtless be a long time, if ever, before New England's cotton manufacture succumbs to outside competition as its iron industry has done; but the fact that its mills already acknowledge their inability to compete with the South in the coarser grades of cotton manufacture is a most important one.

The increased size, weight and speed of street cars consequent upon the adoption of cable and electric traction have made it necessary to improve the running gear, so as to give steadiness of motion combined with ample adhesive power. The lurching motion of long cars, carried on four wheels with a short rigid wheel base is often very severe when the cars are running at high speed, and this motion is not only very unpleasant to the passengers, but also very injurious to the track, owing to the pounding of the wheels upon the rails. In fact, it is said that on the electric lines built in Philadelphia last year the result of this pounding is already to be seen at the rail joints of routes on which four-wheel cars are run at speed. The most obvious remedy of this was to place the cars on two four-wheel swiveling trucks, as in ordinary railway cars, but this plan was found to have two serious objections; the first being that the car body had to be raised to an inconvenient height to allow the wheels in swiveling to clear the sills, and the second being the loss of adhesion power, which, with one motor on each truck amounted to 50% of the weight of the car. Various compromise plans have been designed, including different systems of flexible wheelbase with two axles, and the Robinson radial system, with three axles and pony, or two-wheel trucks; while with four-wheel rigid wheel base cars the truck frames have been extended so as to carry bearing springs near the ends of the body, as in the four-wheel rigid car truck shown in our issue of Nov. 29, 1894. One of the most satisfactory solutions of the problem, however, appears to have been attained in the four-wheel "maximum-traction" truck, designed for eight-wheel cars, which is illustrated in another column. Each truck has one large pair of wheels in front, carrying the motor and a small pair of rear wheels, and the bearings are so arranged that 87% of the weight of the car comes on the two driving axles, while the truck center is close to the driving axle, so that the radial motion of the truck is not interfered with by the car sills or frame. Tests carried out at New Orleans, La., showed that these double-truck cars required no greater expenditure of electric power than the four-wheel cars, while their braking power was considerably higher. As electric cars are now



VIEW SHOWING PILE FOUNDATION; OCTOBER 1, 1893.

VIEW OF FLOORING AND ALTAR



VIEW OF INCLINED PILING IN SIDES OF DOCK; OCTOBER 1, 1893.

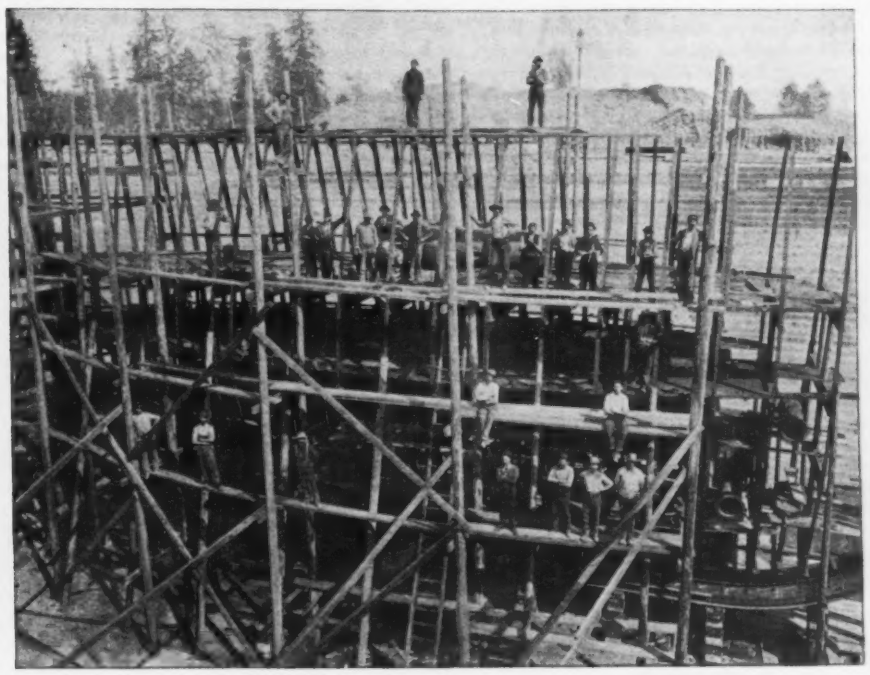
VIEW OF DOCK APPROACHING CO

DRY DOCK FOR THE U. S. NAVAL STATION AT PUGET SOUND, WAS

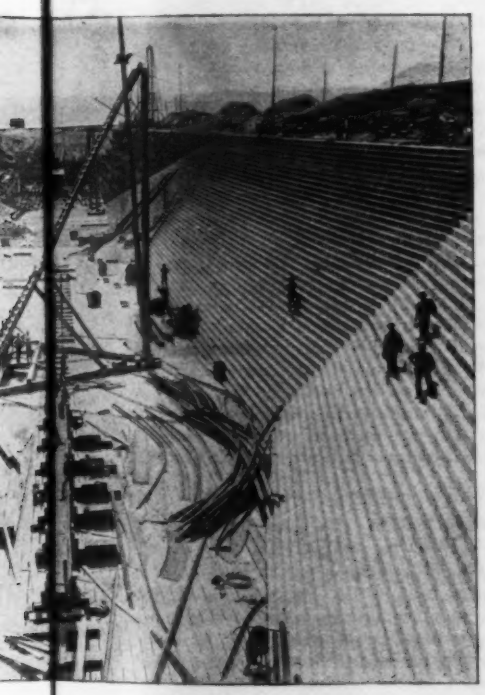
M. T. Endicott, Civil Engineer, U. S. N., Designing Engineer.

F. C. Prindle, Civil Engineer, U. S. N., C

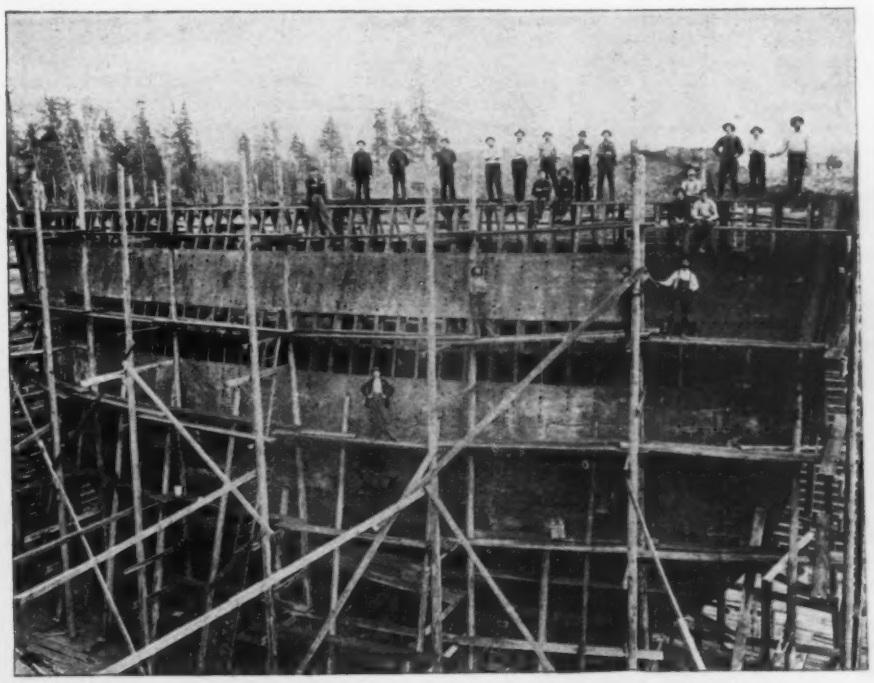
NG AND ALTAR BRACES; MAY 1, 1894.



CAISSON GATE UNDER CONSTRUCTION; SEPTEMBER 1, 1894.



OACHING COMPLETION; AUGUST 1, 1894.



CAISSON GATE NEARING COMPLETION; OCTOBER 1, 1894.

ND, WASHINGTON. PHOTOGRAPHS SHOWING PROGRESS OF WORK.

I. S. N., Constructing Engineer. Commodore E. O Matthews, U. S. N., Chief of Bureau of Yards and Docks.

in many cases competing with the easy-riding and comfortable cars of suburban lines of steam railways, and are entering upon an extensive field of usefulness for freight service, it is becoming more and more important to provide a running gear which will make cars of any desired length to be run without unsteadiness or injury to the track.

The cosmopolitan character of the population of the city of New York is well shown in the report of the Tenement House Committee of 1894. Some of the maps accompanying this report have been effectively reproduced in the last issue of "Harper's Weekly," and from these maps the following points may be deduced. In considering the proportion of each nationality, as taken by descent from the mother, in the total population of 1,515,301, as given in the Census of 1890, we find that over 76% of the white population in the city had foreign-born mothers, and over 40% were themselves born in foreign countries. Taken by nations, under the above classification, the Germans are most numerous, having 403,784 representatives; but those born of Irish mothers make a good second, with 399,348, and the two together made up 53% of the total population of 1890. The "native" population is given as 334,725, or about 22% of the total. Fourth in the list come Russians and Poles, 80,235; then Italians, 54,334, and "other foreign nations" figure at 61,835. The French population is a comparatively small one, and the 16,239 Frenchmen in this city are nearly equalled in numbers by the 15,555 Hungarians. Negroes aggregate 25,674. It should be said that this investigation was chiefly carried on in the tenement districts, and nationalities collected in colonies were mainly considered. For this reason those scattered over the city were not considered, as the number was comparatively small and they figure in the list of "111,285 unclassified."

As to density of population, Sanitary District A, in the Eleventh Ward, shows the greatest concentration of population in the world, estimated in 1894 at 986 per acre. This is about twice the density of a certain section of the city of Prague, which in 1893 held this dubious record. This density of population is most marked in the district lying between 14th St. and the Brooklyn Bridge, and made up of parts of the Eleventh, Seventeenth, Tenth and Seventh Wards. This makes a very dark spot in the "density of population" map, though another East River district, extending from 70th St. to 86th St., shows a tenement house population of from 400 to 600 per acre. On the Hudson River side of the city there is only one district showing as many as 200 to 300 people per acre, as a maximum, and that is between 40th and 59th Sts., and west of 8th Ave. The business portion of the city stands out prominently by the thinness of its resident population. The Italians and the Russians and Poles are chiefly remarkable for concentration in national colonies; the Germans, Irish and natives mixing in fairly equal proportions in the several districts of the city.

THE PROPOSED CHANGE IN CAR INTERCHANGE RULES.

As most of our readers know, the interchange of freight cars between the different railways of the country is governed chiefly by a code of rules compiled by the Master Car Builders' Association. These rules have grown more complex year by year until they have become, in some respects, exceedingly burdensome; and there are strong probabilities that at the convention next June some wholesale reforms will be introduced. The matter is one of such great importance to every department of the railways, and to owners of private line cars, and even to shippers, that some explanation of these proposed changes will be of interest.

In the first place, the underlying idea on which the rules have been based has been that when a railway had the use of a car belonging to another company, it must return the car in as good condition as when it received it. Apparently, nothing could be fairer than this basis; but it has been found to contain possibilities for making trouble which were never suspected when it was adopted.

Evidently, if a railway is made responsible for the delivery of every car in good order, it must look out that it receives no cars that are not in good order; otherwise it may be saddled with the responsibility for making repairs of defects which may have been caused on some other road, months before. It, therefore, became necessary to maintain a force of car inspectors at every interchange point, and every car received had to be carefully examined before acceptance; first, to see whether it was safe to run, and, second, to see whether it were in perfect order in every way. Obviously this second part of the inspector's duties consumes far more time than the first part. It is a simple matter to see that the car is safe to run; but it is a long task to carefully look over every detail of a modern freight car and see that no part is defective.

But, aside from this, if every car had to be stopped in its journey and repaired, or put in "good order," before it could pass from one road to another, the movement of freight would be almost impossible. To meet this difficulty, some genius years ago invented the "defect card."

The defect card is practically an acknowledgment of responsibility for the repair of a certain defect by the railway which signs the card and attaches it to the car. Thus, if the Erie road delivers a car to the New York Central at Buffalo, and the New York Central inspector finds some defect which does not, however, render the car unsafe to run, he will demand a defect card of the Erie inspector, and will not accept the car unless it is given. The car may then run for months with this defect card attached, or any company, which finds it convenient to do so, may make the repairs which the defect card calls for and send the bill to the Erie Company.

It is fair to say that to the defect card system is due the credit for making the movement of freight cars possible under the basis of making every user of a car responsible for its condition. It must be said, on the other hand, that the defect card has opened a wide door to petty disputes, difficulties and troubles, in the car departments, and has done its full share toward making life a burden to those in charge of these departments.

There has been for some years a tendency in the Master Car Builders' Association to make car owners responsible for a greater number of defects in the repair of cars, but the relief obtained in this way has not equalled the growth in complexities and difficulties in the general matter of interchange. What is needed is a radical departure from the old basis so long adhered to, and for the proposal of such a change and the work of bringing it about, credit should be given to Mr. J. N. Barr, Superintendent of Motive Power of the Chicago, Milwaukee & St. Paul Ry.

The new basis proposed is simply this: Make the owners of cars responsible for all repairs to them, except such as are due to accidents, wrecks or serious misuse, rendering the car unsafe to run. When this change is made, the necessity for inspecting every car received to see if it is in perfect order, will disappear. Inspectors will simply see that all cars received are in safe condition to run. Further, no repairs not necessary for its safe running will be made on a car when it is away from home. In this way each road will have better control of its own cars, and, also, having sole responsibility for their repair, it will be inclined to use better material in building them. Thus the proposed change will put a premium on the building of good and durable cars.

Not less will be the benefit in the matter of obviating delays. The ironclad rules of the M. C. B. Association have grown more and more a thorn in the flesh to the traffic officers in recent years, and a change which permits every car which is safe to run to pass interchange points without delay will be earnestly welcomed in this quarter.

The chief objection to the proposed change will probably come from the private car owners, who have held a soft thing so long that they will be loth to give up even a part of it. While the influence of some of these companies is considerable, there is little doubt that the present mileage rate paid car owners for the use of their cars is ample to cover not only the interest and depreciation on the investment, but also the cost of the repairs made necessary by ordinary wear and tear.

From present appearances, neither the objections of private car owners, nor those of any other interest will be sufficient to defeat the proposed change. Nearly all the roads entering Chicago have been working under the new system (by mutual agreement with each other) for several months and with gratifying results. A large number of prominent car department officials in the East have expressed themselves as heartily in favor of the change, and many, who were at first opposed to it have declared in favor of it on further study of the matter.

Doubtless, defects will be found in the new plan, as in most other things of man's devising; but it promises, at least, a large improvement over the present system, and action upon it by the convention next June will be awaited with interest.

CHEMICAL METHODS OF PREVENTING AND EXTINGUISHING FIRES.

For a number of years the efficiency of certain chemicals in the extinguishing of fire has been known, and, to a limited extent, has been put into practical use. The most common system, probably, is that in which water is saturated with carbonic acid gas under pressure, and gives it off freely when the pressure is removed. This gas pressure is made use of to furnish power to direct the jet of gas-charged water upon the fire. This method of fire-extinguishing has been chiefly made use of in "portable" fire extinguishers, of which several styles are made and have been on the market for a number of years. Chemical engines for the use of city fire departments are also made and are in use, with fairly satisfactory results, in a large number of cities, though they are properly regarded as supplementary only to the ordinary fire apparatus. The field in which chemicals do most effective work is in the extinguishing of fires at their outset. After a conflagration is once under full headway, nothing but deluging with enormous quantities of water will serve to check it. This is really nothing against the use of chemicals, however. More success by far in reducing fire losses has been attained by preventing fires or extinguishing them at the outset than by appliances for putting them out after they are under full headway. Such appliances as automatic sprinklers and fire pails and the use of fireproof and slow-burning construction have reduced by many millions the country's fire loss. Hence the fact that chemical methods of fighting fire are intended to check it at its outset is really a strong point in their favor.

The objections to the carbonic acid class of fire extinguishers, however, have been such that while their use has reached considerable proportions, insurance experts have never been inclined to look with great favor on them. If the gas is stored in a reservoir under pressure, the slightest vent will permit it to leak away, and as such extinguishers are apt to stand for years unused, the loss of pressure is not likely to be discovered until the emergency comes when the extinguisher is wanted, and it then proves useless. In another class where acid and marble-dust are kept separate in the interior of the extinguisher until the emergency comes, and are then mixed by turning a handle on the exterior, we have the difficulty of storing acid in a receptacle for an indefinite time, without trouble from its corrosive effects, or the acid may be spilled prematurely, or its fumes may act on the interior of the vessel. A second difficulty with this class of extinguishers is that there is some danger in connection with the sudden generation of gas in the interior. The vessel having no safety valve, a pressure so great as to cause its violent bursting may be generated, especially if the opening of the valve which leads the confined water to the hose should be delayed. On the other hand, when this pressure is once exhausted, no force is available to throw the water, and the extinguisher becomes useless.

The modern methods of fire protection by chemicals, which bid fair to entirely displace the old, consist in the use of certain salts which, when heated, give off a gas which extinguishes the fire partly by shutting out the supply of air, and partly by the cooling effect produced by the separation

of the gas from the salt. For fire-extinguishing purposes the salt is dissolved in water and used either to fill fire pails or portable extinguishers with a hand force pump and hose attachment. An important advantage is that the salt in solution has little or no corrosive effect, and by the mixture of other substances the solution may be made deliquescent, so that it will not dry away when left in the pails.

The effect of such a chemical solution in the extinguishing of fires is truly remarkable. Water poured on a fire, as is well known, has little effect except on the part which it actually touches; but the chemical solution gives off at once a gas which rises and envelopes all parts, extinguishing the flame as if an invisible blanket were wrapped about the blazing pieces. Of course, when a fire has been burning for some time, and a body of hot coals has accumulated, the heat actually stored up in the coals must be dissipated in some way. The rapid spread of fire occurs, however, by the spread of the flames, and the influence of the chemical solution in checking this is equal to the effect of a volume of water many times as great, with the additional advantage that the gas will rise and check the flame in closed spaces, such as hollow partitions, where water cannot reach.

The expense of the chemicals is not great, especially in view of the fact that the necessity for their use is a rare occurrence.

One of the applications of this method of fire extinguishing which is of especial interest to engineers is its value in extinguishing fires due to oils, petroleum, or other very inflammable substances. The futility of pouring water on a mass of blazing oil is well known, and sand is the general reliance for extinguishing such fires. But by the use of chemicals an oil fire may be coped with as readily as any other fire, as we have witnessed in repeated tests.

Besides the use of these chemicals in fire pails and portable extinguishers, it is proposed to equip apparatus with these chemicals for the use of small villages, and manufactories. There are thousands of small hamlets without a public water supply or any other means of fire protection to which some simple and inexpensive apparatus of this sort would be a great benefit.

But the use of these chemicals for the actual extinguishing of fire is only one direction in which their value has been proved. We describe in another column a method of treatment of wood by impregnating it with a solution of such chemicals, which makes it practically incombustible. Where less complete protection is sufficient, the chemicals are added to paint or kalsomine, and the wood covered with such a coating develops a surprising resistance to the spread of flame. When it is remembered how exceedingly inflammable is the ordinary finish of oil, paint, and varnish with which wood is usually covered, the value of a compound to offset this is evident.

Still another application of these chemicals is to the fireproofing of fabrics, such as theater curtains and scenery, and even fine lace curtains. Fireproofing solutions for this purpose have, it is true, been known and used for several years, but they have been so expensive as to make their general use out of the question. The chemicals referred to above, however, are of moderate cost.

We regret that we are unable to state just what chemicals are used in these various processes. Some of the companies marketing these articles claim the protection of patents, while still others keep their processes secret. In general, however, we believe that ammoniacal salts are those which are principally used, with perhaps some of the chlorides.

Whatever the exact composition of these compounds may be, we have become convinced, after an investigation extending over several months, that there is much merit in some, at least, of these chemical methods of fire prevention, and that by their use the fire risk and losses may be materially diminished. As little has ever been printed concerning these new methods, however, they are not yet familiar to engineers, and we have deemed it well, therefore, to call the attention of our readers to them.

LETTERS TO THE EDITOR.

TESTS OF BRICK.

Sir: It will interest some of your readers to know that the valuable table of tests of brick, made by Mr. E. S. Fickes and published in your issue of Dec. 13, 1894, formed a part of his thesis presented for the degree of Civil Engineer at the Rensselaer Polytechnic Institute in June, 1894. Palmer C. Ricketts.

Director, Rensselaer Polytechnic Institute.

Troy, N. Y., Jan. 2, 1895.

HORSE POWER REQUIRED TO PROPEL CARS.

Sir: Your correspondent "G" calls attention to a typographical error in my formula for horse powers on grades. The error consisted in leaving out S after the 2. It should read $HP. = W \frac{3S + (2S \times \%)}{37.5} v$.

Yours truly, Waterman Stone.

Providence, R. I., Jan. 22, 1895.

A PROBLEM IN HYDRAULICS.

Sir: As an addendum to "Engineering Facts vs. Credulity," in your issue of Jan. 10, will you ask Mr. Geo. Y. Wisner to please explain how the Mississippi River got to be 100 ft. deep above the Passes where once the water was only 8 to 12 ft. in depth? Also, get him to tell why the sand, which is carried through the deep pools with small slopes, stops on the bars, where the depths are less and the slopes greater.

Again, why are there more shoal places and shallower water in a given river within that reach in which the fall is the greatest?

Respectfully, H. M. Marshall.

Vicksburg, Miss., Jan. 14, 1895.

STRENGTH OF CONCRETE AND STEEL IN COMBINATION.

Sir: Please publish the following corrections to my communication on the above subject in your issue of Jan. 3:

In line two from bottom in first column, change the word "strength" to "distortion."

In Eq. (1) omit the last term "$= \frac{80{,}000}{f} h$" entirely.

In Eq. (5) make middle term read $\frac{f b d}{2}$ in place of $\frac{f b h}{2}$.

Yours truly, J. B. Johnson.

Washington University, St. Louis, Jan. 14, 1895.

ORGANIZATION AND MANAGEMENT OF A CITY ENGINEER'S OFFICE.

Sir: It has just been brought to my notice that in your editorial of Dec. 6, p. 470, in which you kindly drew attention to the discussion by the Boston Society of Civil Engineers on the Organization and Management of a City Engineer's Office, you refer to this discussion as being printed in our November issue, whereas it appeared in the October Journal. As I have had recently an unusual inquiry for the November Journal, I venture to ask that you will make the correction in your next issue.

Yours truly, John C. Trautwine, Jr.,

Secretary Association of Engineering Societies.

Philadelphia, Jan. 15, 1895.

THE EFFECT OF THE RECENT FILTER PATENT DECISION ON THE WARREN FILTER.

Sir: I have read with interest the editorial note in your issue of Jan. 17 regarding the recent decision of the Circuit Court of Appeals in the matter of mechanical filtration, but it seems to me that you leave readers somewhat in the dark as to the present status of the manufacturers of mechanical filters other than those mentioned in the article. For this reason I would call your attention to the fact that this company has made it an invariable rule to install a settling tank wherever a Warren filter was to be used with a coagulant. Under this system the water, after receiving the coagulant, remains at rest for a considerable time, during which both coagulation and sedimentation take place. It is evident from this, therefore, that under the decision of Judge Wallace, the Warren filter has never in any way infringed the Hyatt patent, which will doubtless be of interest both to users and those contemplating its use.

Yours respectfully, W. B. Nye,

Manager Cumberland Mfg. Co.

Boston, Mass., Jan. 21, 1895.

(The editorial note, to which reference is made, included this sentence:

Where the combined coagulant and water pass to a settling basin before going to the filter, the decision states that there is no infringement.

No mention was made in the note of any specific filter, except those involved in the suit. There seems to be no doubt but that the Warren filter is entirely clear, as well as those Jewell or Morison-Jewell filters with settling tanks mentioned by Judge Wallace in his decision.—Ed.)

RATING CURRENT METERS.

Sir: Referring to the article by Mr. Price in your issue of Jan. 10, it will be noted that he mentions the fact that the rating will be more accurate when the skiff is pulled with a rope to the bank than when it is propelled with the oars. I think this point should be more strongly emphasized, and that a rating should never be taken in a skiff which is being pulled with the oars. Not only this, but the observers should be cautioned about keeping the same positions and not swinging their bodies from one side to the other while the observation is being made. On several occasions during the rating of Mr. Price's meters (of the electric pattern) I have noted an appreciable error, apparently due to this cause.

As to the depth at which the meter should be placed, my experience has proven that 2½ ft. is not enough, especially for high velocities, and I now place it at about 5 ft. In a rating taken from a steamer drawing 2½ to 3 ft. of water, with the meter in 10 ft. of water, a large error was found over other ratings of the same meter, and it was then rated at 20 ft. under the surface.

It is often quite impossible to find a body of still water where the conditions are suitable for rating a meter, and I question whether or not a slight current, or even an oscillation, if they are reasonably constant, are serious objections. Certainly, you can obtain results well within the degree of accuracy obtainable in other respects. Care must be taken however in getting your observations in pairs as regards the time of moving over the course in both directions. You will then have two lines of points, when plotted, and can combine the points two and two and get the mean curve. Another point to be emphasized, viz., observations should always be taken in both directions over the course.

I would also warn beginners not to be misled by the statement that the elastic curve will pass precisely through all the points; for this statement is preceded by the one that the points are in their true positions (theoretical positions, I presume). This is not possible to the practical observer. I prefer the method of taking observations all along the line, believing it more accurate than the method of bunching at low, medium and high velocities, and will add that under these conditions it requires more than three paper weights to place the straight edge in the proper position. Yours very truly, Chas. H. Miller.

Greenville, Miss., Jan. 14, 1895.

THE DISCHARGE OF THE NIAGARA RIVER AND THE LEVEL OF THE LAKES.

Sir: Your issue of Dec. 27, 1894, contains on p. 528, a paper by Maj. E. H. Ruffner, Corps of Engineers, U. S. A., entitled "The Discharge of the Niagara River." This paper, while reviving memories of the discharge of the assistant so voluminously alluded to, will be remembered mainly for the conclusion reached as to the effect of the Chicago Drainage Canal on the levels of the Great Lakes. This conclusion is stated in the last two sentences of the paper, as follows:

"The deduction drawn from these measurements is clearly stated in the report: 'Near mean lake level the discharge increment is about 21,000 c. f. s., for a change of 1 ft. on the Buffalo gage, or in level of Lake Erie.' The half of that—the amount proposed to be drawn off by the drainage canal—would, at that stage, lower the lake level somewhat more than ½ ft., about 0.7 ft., as shown by the curve."

You quote in your editorial note, p. 534, same issue, from this conclusion, in the following words: "The flow through the Chicago Drainage Canal, when it is completed some three years hence, will lower the lake level about 0.7 ft." By so doing you have, unintentionally, given to your readers a very wrong impression. Referring to Major Ruffner's conclusion, a direct numerical calculation shows that the change of lake level should be approximately 10,000 ÷ 21,000 of a foot or 0.476 ft., instead of 0.7 ft. Or, referring to the curve alluded to by Maj. Ruffner (see pages 194-197, Engineering News, March 2, 1893), it will be seen that at or near mean lake level the lake would be lowered essentially 0.5 ft. by the withdrawal of 10,000 c. f. s. This, however, is based on the hypothesis that the curve referred to and used by Major Ruffner is correct.

The curve, the equation of which is given on p. 196 (above cited), first column, is shown graphically on p. 197. Studying the curve more fully than the paper discusses it, the following facts pertaining to the withdrawal of 10,000 c. f. s. are discovered: 1. At extreme low water the lake level will be lowered 0.25 ft. very nearly. 2. At mean lake level it will be lowered 0.50 ft. very nearly. 3. At high stages the level of the lake will be raised. (See appended note.)

This latter fact is admitted in the official reports, but is brushed aside with the excuse that the measurements of flow were not actually made during the higher stages, and therefore the curve cannot be expected to apply at high stages. It is equally true, perhaps more so, that it is not applicable for the lower stages, for the reason that measurements actually were made and fail to prove the curve. The fact is, that the application of the formula: $y = S + Tx + Ux_2$, etc., while it may be very good mathematics, is very poor mechanics. The highest and lowest of the measurements are not entitled to equal weight with those of intermediate magnitude since additional observations at lower or (especially) higher stages might materially modify the shape of the curve at its extremities. It follows, therefore, as may be seen by reference to p. 197, above cited, that any number of curves, much more rational than Major Ruffner's may be drawn showing the variation in question at or near mean lake level. And any one of these will show less lowering of the lake than does the Major's curve, besides meeting the requirement that the discharge shall continue to increase as the lake rises. I have not the time at this writing, but I may soon presume on your goodness with some further data and demonstrations as to the subject in hand.

For the present it is sufficient to refer to the rather ludicrous criticism that the withdrawal of 10,000 c. f. s. by the Chicago Drainage Canal will have the effect of but slightly altering the lake level of Lake Erie at its low stages, and have rather more influence at the mid-stages and finally, but unfortunately, menace the harbors and shores, with floods at high stages, since the withdrawal of water will cause the lake to raise at high stages.

On p. 196, above cited, third column, it is stated: "At a local gage height of 4.0 ft., equivalent to Buffalo gage height + 5.0 ft.," etc. That these gage readings are equivalent is doubtless concluded from the lower curve on p. 197. A straight line passing through the mass of observations as platted would be more rational, and the "equivalent" Buffalo gage reading would be about + 2.0, or within the ordinary range of the lake. This appears to be another example of good mathematics and poor mechanics. It follows that the discharge curve on the same page will begin to show decreasing discharge, as the lake rises, within the ordinary range of the lake. Very respectfully,

Thomas T. Johnston,
Asst. Chief Engineer, Sanitary District of Chicago.
Chicago, Ill., Dec. 31, 1894.

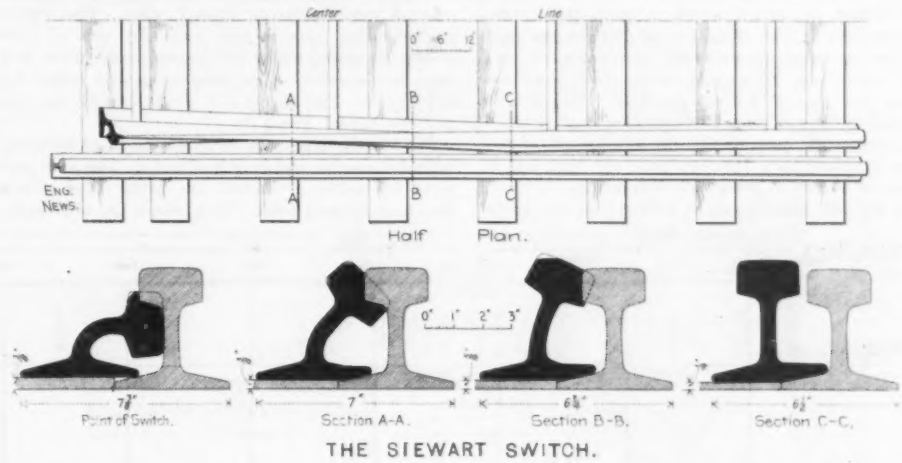
THE STEWART RAILWAY SWITCH.

In the form of switch rail usually employed for split switches the end is made tapering by cutting the head and flange away on the inner side, to allow the point to fit against the main or stock rail. As the switch rail is not parallel to the main rail, it is necessary, in order to obtain the feather edge required at the point of the switch, to plane off the head and a portion of the web on the outer side, so that the switch rail is weakened and its stiffness is reduced. The object of the Stewart patent switch is to prevent such cutting away and weakening of the switch rails, and this is attained by means of twisted switch rails, as shown in the cut.

The switch rails are constructed of lengths of ordinary rails, twisted in the web, so that at the point end the outside edge of the head will be on top, the web being bent at right angles, while the degree of twist diminishes towards the heel, where the rail is of normal section. At the point, section A-A, the switch rail is raised by means of a plate of sufficient thickness to allow the flange of the rail to overlap the flange of the main rail, and also to allow the head of the switch rail to rest against the web of the main rail, and by planing away a very small portion of the head of the switch rail, it is allowed to fit in closely to the head of the main rail. The switch rail slopes upward from the point and the flange overlaps the flange of the main rail more and more until at 6 ft. 8 ins., section D-D, from the point, the switch rail has reached a normal position with its flange close to the web of the main rail.

In the construction of this switch, the only material planed off is that portion of the head of the switch rail shown by the dotted lines, and this is planed in such a manner that the head of the switch rail fits closely to the head of the main rail. At 3 ft. from the point, section B-B, the flange of the switch rail gradually rises, and is made to conform with its position on the flange of the main rail, the metal not being planed off. It is claimed that, as the twisted rails are not weakened so much as those of the ordinarily tapering construction, they will be more durable. The switch can be used in any interlocking system and in any place where a split or other switch is used. Ten of these switches are in use on the Chicago, Rock Island & Pacific Ry. and four on the Illinois Central R. R.

The switch is the invention of Mr. Shaw Stewart, general foreman of the Morden Frog & Crossing Works, of Chicago, and he has made arrangements for its manufacture and sale by the American Railway Maintenance Syndicate, of New York city, which has the exclusive agency.



THE SIEWART SWITCH.

AN IMPROVED LEVEL TUBE FOR ENGINEERS' TRANSITS AND WYE LEVELS.

The accompanying cut illustrates a so-called "reversion" level, which has been recently placed on the market by Seelig & Kandler, of Chicago. The method of operation of this level is shown in the illustrations, Figs. 1 and 2. The glass tube containing the bubble is uncovered on top and bottom instead of on the top only, as is the case with the ordinary level tube, and therefore, can be read in the reverse position as well as in its normal position. A graduated scale serves to show when the bubble stands at the center of the vial. The inside of the vial is ground in such a manner that when the bubble stands at the center, the tangents, t t and t' t', Fig. 2, are parallel to each other end to the line of collimation.

Such a level, when attached to a transit telescope, is adjusted in the following manner: Bring

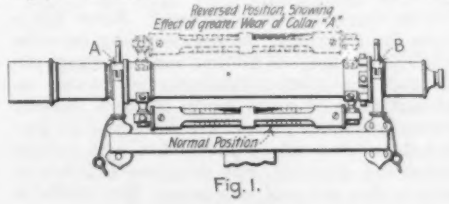


Fig. 1.

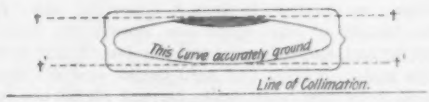


Fig. 2.

A Reversible Level Tube.

the bubble to the center of the graduated scale and bisect with the horizontal cross-wire some distant obect. Reverse the telescope and bisect the same object again, and if the bubble still plays in the center, the line of collimation is parallel to the tangents of the curves of the interior surface of the glass tube. If there is any deviation, adjust the half error by means of the adjusting nuts, provided for that purpose on one side of the level tube mounting. Of course, before the above adjustment is made, it must be ascertained whether the horizontal cross-wire is in perfect adjustment.

The "reversion" level attachment is also a convenient and useful device when attached to an engineer's wye level, for by means of it the wear of the collars can easily be ascertained. The collars on a perfect wye level should be of the same diameter, but in course of time they will wear where they rest in the wyes, and in almost every case this wear is not the same on the two collars. If the level attached to the level telescope is adjusted in the usual manner by reversing it end for end in the wyes, it will be adjusted parallel to the bottom of the collars and not parallel to the line of collimation, and, in consequence, the line of sight will be inclined. But, in case the telescope is provided with a reversion level, if, after the adjustment is performed in the usual manner, the telescope is rotated 180° in the wyes, the bubble will indicate the full error, which arises from the imperfect collars (Fig. 1). The half error thus observed can either be adjusted or taken into consideration when leveling up the instrument.

It may be noted that, strictly speaking, the device is not a new one. It was first proposed at least a quarter of a century ago, but it has been very little used, chiefly on account of the difficulty of forming the interior of the glass tube with the necessary precision.

PAINTING STRUCTURAL IRON-WORK.

At a meeting of the Association of Engineers of Virginia, Mr. Samuel Wallis spoke upon the important subject of the proper painting of wood and structural iron-work, and a synopsis of this talk is given herewith.

Mr. Wallis introduced his subject by saying that few engineers or architects pay any attention to the character or composition of the paint used, and remain apparently satisfied with the selection of a suitable tint. The claim, often made by the older painters, that the paint now employed is not as good as that of twenty or thirty years ago, is not supported by proof. The truth is that not one painter in a hundred knows what he is using, simply because he has no opportunity to do so, and because some of the "mixed paints" now supplied would puzzle a pretty fair chemist to analyze. Large corporations, however, are now beginning to employ chemists to work hand in hand with practical men, and as a result the durability and excellence of materials are being increased and the cost lowered. Mr. Wallis is of the opinion that both paint and oil used should be carefully examined by an expert for all important work.

In regard to the use of inert pigments and binders, now much advocated, the speaker thought it would probably be better in most cases to use a pigment forming a hard, insoluble soap with linseed oil. Such a paint is elastic, and if the proportions of soap-forming material are such as to prevent complete chemical combination with the oil used, some oxidized linseed oil, or linsleic acid, is left as an elastic binder.

The qualities of good paint are, of course, covering power, fineness, mixibility, and durability. In Virginia, where houses are built almost entirely of the timber of the long-leaf yellow pine, Mr. Wallis recommends the following paint formulas as likely to give good service:

For a priming coat: 100 lbs. of pure white lead

in oil, 4½ gallons of pure raw linseed oil, and one gallon of pure spirits of turpentine. This gives 8 gallons of paint ready for spreading, and should be allowed 48 to 60 hours for drying, and more in damp weather. But under no circumstance should the second coat be applied until the priming is thoroughly dry.

The second coat should be made of 100 lbs. of pure white lead tinted to shade, with not more than 12 lbs. of tinting material; 5 gallons of pure raw linseed oil, and 1 quart of good, strong turpentine dryer. The third coat should be made of 100 lbs. of paste, compounded as follows: 60 lbs. pure white lead, 30 lbs. zinc white, free from sulphides, 10 lbs. of tinting material. To this is added 5 gallons of pure kettled-boiled linseed oil.

For iron-work, good results can be obtained, as follows: Priming coat, 100 lbs. pure red lead and 5 gallons of pure raw linseed oil. Second coat of black color, 100 lbs. paste made as follows: 65 lbs. finely hydrated sulphate of lime, 30 lbs. fine quality of lampblack, 5 lbs. of pure red lead, and to this paste add 20 gallons of pure kettle-boiled linseed oil. This makes 30 gallons of paint, and the third coat should be of the same materials.

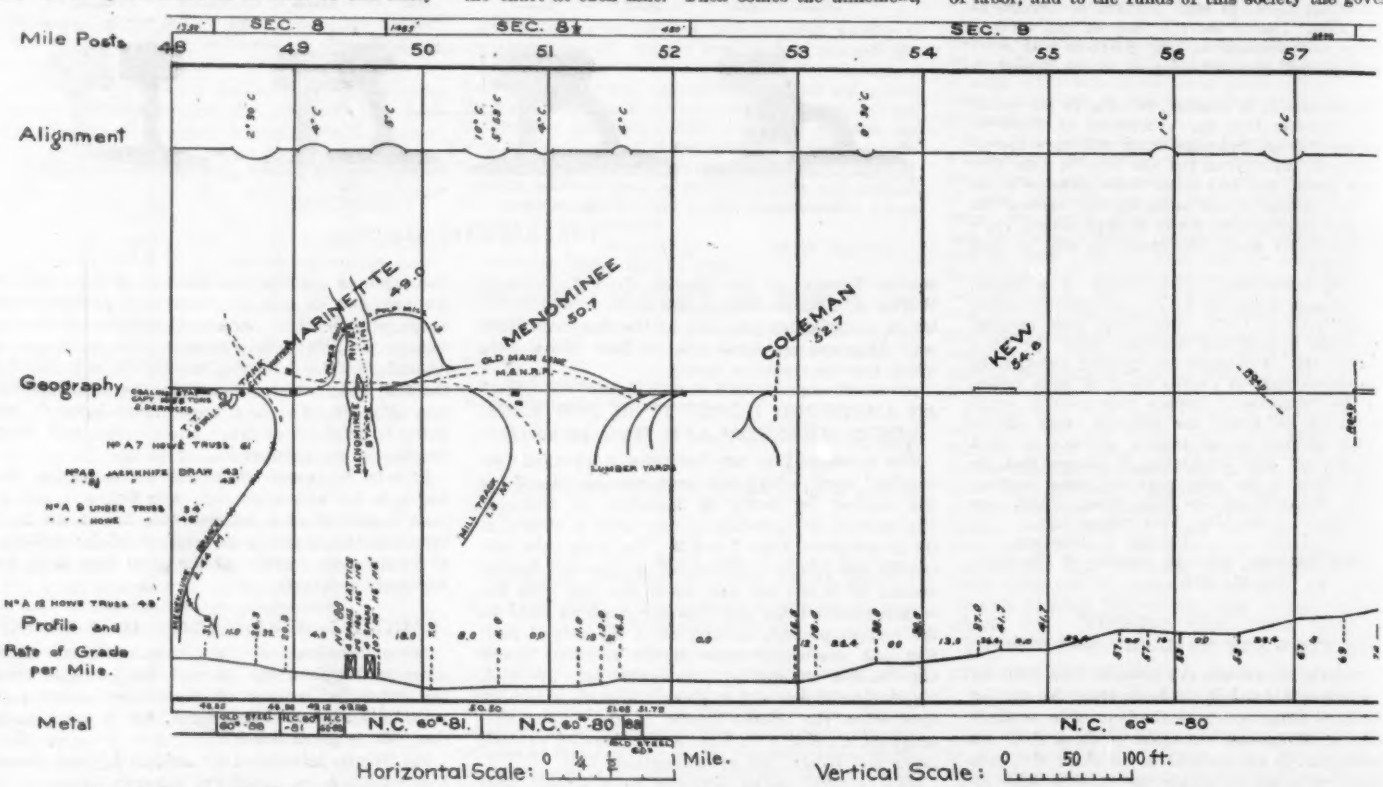
There are various substitutes for linseed oil, such as Sipes Japan oil, Lucal oil, etc., all of which contain some proportion of turpentine. While these are fairly satisfactory for a priming coat on wood, they should not be used on iron, or for finishing. To obtain good results every article should be tested by a competent expert; and without these tests specifications alone have a very doubtful value.

The priming coat is of the utmost importance, and should be applied more carefully than the top coats. It is an axiom that paint is never better than the material it covers, and a poor priming coat under a good top coat is sure to give unsatisfactory results.

GRAPHICAL CHART OF RAILWAYS.

Most railway companies nowadays keep some system of map or chart record which shows at a glance the alinement, profile and important features of their lines, but the methods of making such charts vary very considerably. We are indebted to Mr. C. Palmer, M. Am. Soc. C. E., Division Engineer of the Chicago & Northwestern Ry., for blue prints of a graphical chart of the Peninsula Division of that road; and we show herewith a specimen of a part of the chart, slightly reduced (the horizontal scale of the original being 1 mile to the inch, and vertical scale 100 ft. to the inch). This chart was made for the use of the operating department of the road, and, besides giving a graphical representation and profile of the line, it locates and briefly describes all the truss bridges, roundhouses, turntables, coaling and water stations, and a record of the rails, being intended to include such physical features as pertain especially to the track and operating departments. There is also given, in one corner of the sheet, a graphical map of the division on a small scale. The charts are corrected once a year and new sets of blue prints are made, which are framed under glass and hung in the office, or cut into strips and folded for the pocket. The sheets are about 34×52 ins. inside the border lines.

The top line gives the limits of the track sections, with the number and length of same. The next line gives the miles, a vertical line being ruled across the chart at each mile. Then comes the alinement, with the degree of each curve noted. Below this is shown the geography, the railway being indicated by a straight line, all bridges, road crossings, sidings and spur tracks, buildings, etc., plotted on, and particulars of spans, grades of spurs, capacity of roundhouses, etc., noted. The townships are also marked. Under this is the profile, with bridges marked and described, and elevations and rate of grade in feet per mile also noted. The profile is broken, as required, to keep it below the plan. At the bottom of the chart are shown the make, weight and date of rails, and the length laid with each make. Station and yard tracks are only indicated, reference being made to yard plans, but exterior sidings and spurs are as shown, except that spurs to mines, etc., are not plotted to scale, but each sheet is a table showing the dates of construction from point to point, by years, and another table giving the location of each bridge, its record number, and its clearance in width and height.



SAMPLE OF GRAPHICAL CHART OF THE PENINSULA DIVISION OF THE CHICAGO & NORTHWESTERN RY.

THE LABOR LAWS OF BELGIUM.

Belgium is a little state among nations, having an area of only 11,373 sq. miles and a total population of about 6,500,000; but it is one of the nations that has seriously devoted its attention to benefiting the condition of the laboring classes, and at this time it is at least interesting to note the methods there adopted.

The serious strikes of 1886 in the Charleroi district led the Belgian government to establish a labor commission, which was to closely study the condition of labor and to propose measures of amelioration. This commission was made up of the most eminent economists of the country and the result of its two years of labor were the laws and institutions here referred to, as taken from a late report of Hon. James S. Ewing, U. S. Minister to Belgium.

A Council of Labor and Industry was established by the Parliament, with various sub-committees in the principal industrial centers of Belgium, with its members especially selected for their competency to consider labor questions and to study all measures of relief that were proposed before they became laws. This Council also sought to adjust differences arising between the proprietors and laborers, and by its intervention has prevented many strikes and quickly ended others.

A national society has also been organized for the assistance of workingmen disabled by the accidents of labor, and to the funds of this society the government contributes from time to time. Substantial citizens, engaged in manufacturing and the various departments of labor, manage the society, and it has so far not only benefited individuals, but has produced a better feeling between the laborer and his employer.

Among the principal laws enacted as a result of this inquiry, the following are cited by Minister Ewing: A law regulating the employment of women, young men and children in the mines and factories; prohibiting the employment of children under 12 years of age, and fixing conditions for the employment of boys under 16 and women under 21 years of age. Other laws provide that wages are not liable to seizure, determine the conditions governing the payment of workingmen, prohibit the payment of wages by an equivalent in merchandise, food, etc., and forbid the payment of wages in any building where beer or liquors are sold.

The unemployed or idle persons still remaining, in spite of all governmental provisions, are considered in three classes, as follows: First, the idle, drunken or vicious; those without homes or visible means of support and properly termed vagrants. These people are dealt with by the criminal authorities, and after trial and conviction are sent to Hoogstraeten, a reformatory prison, where they are required to labor for from three to six months, or longer if previously convicted of the same offence. This prison is governed by civil employees of the state, assisted by military force when required, and comprises a series

of shops for the manufacture of clothing, shoes, tools, etc. Those who have no aptitude for handicraft are utilized in field labor.

The second class considered include unemployed skilled laborers, and the third class is made up of those who have no profession or trade and can do the simple kinds of work only. To meet the labor questions arising out of the involuntary idleness of these two classes, the different provinces and cities have adopted methods as seem to each best adapted to controlling conditions. Brussels has founded a "Bourse du Travail," or labor bureau, which has been in operation since April 5, 1889, and in the intervening time about 35,000 laborers have there entered their names. This bureau is beneficial to skilled laborers only, serving as an intermediary between employer and workmen, in finding men for the one and employment for the other. At one time money was distributed, but this was soon discontinued, as it brought to the bureau a host of the chronically idle and worthless. The experiment of providing irregular work for men of this class also proved a failure. When put to sweeping snow, cleaning up new quarters of the city, or in levelling dump-heaps, it was found that the useful effect furnished by the best of them did not amount to three-fifths of the labor of a good workman, and in other cases to one-fifth only.

This failure led to the founding of a "Maison du Travail," or work-house, where only manual labor of slight importance is provided for those who desire to gain support by work of any kind. These men prepare small bundles of kindling wood, which they are allowed to hawk about the city in hand carts, and they also cultivate a vegetable garden, make wooden shoes, etc. In return they are provided with food and lodging, and any excess of the product of their labor can be applied to the purchase of tobacco, beer, etc.

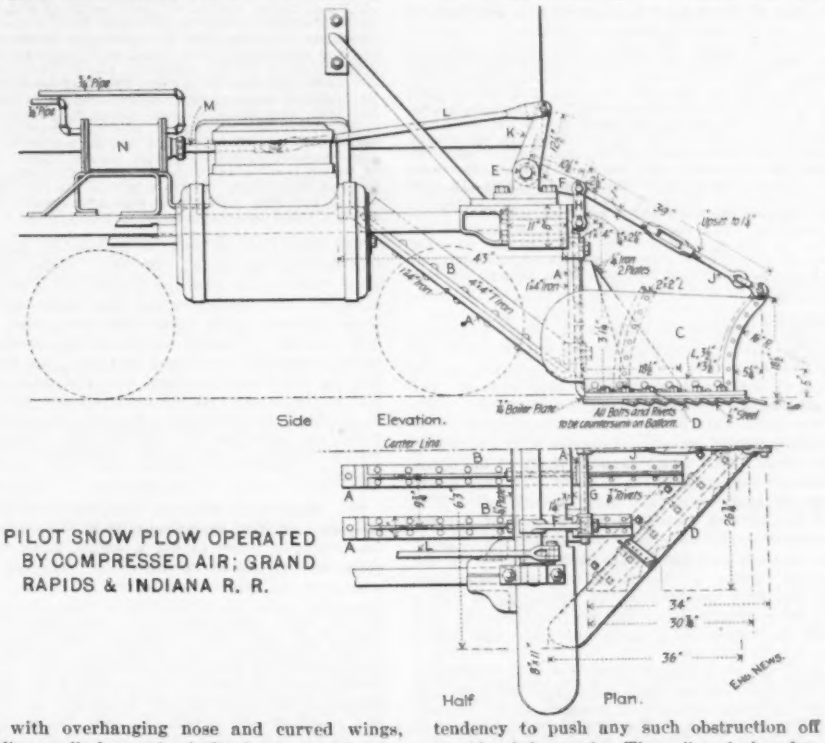
Mr. Ewing does not enter into the subject of the general effect of these laws, other than to say that the condition of the workingman in Brussels, if not better, is at least as good as in any capital of Europe. But from an inquiry made, in February, 1894, under the direction of the "Bourse du Travail," it is demonstrated that out of a population of 52,243 workingmen, only 1,527, or 2.92%, were the victims of enforced idleness. Of this number, 914 reported that they were always idle at that time of the year, and 107 were idle because of sickness and accident. It was also found that less than one-half of the unemployed were assisted by official charity, and the remainder were living on their savings, or upon private charity. The same report says that the condition of the workingmen's households generally indicated order and morality, and only one-sixth of the total number of the houses of unemployed workmen were reported as unclean.

PILOT SNOW PLOW FOR LOCOMOTIVES; GRAND RAPIDS & INDIANA R. R.

The use of pilot plows, or snow plows bolted to the engine pilot, is common on most railways which have to deal with moderate or heavy snowfalls, as they serve to keep the track from getting blocked with snow, except in case of very heavy storms or drifts, and enable the trains to make better time by clearing the track of light snow. In general these are curved plates rigidly bolted

to or in front of the pilot, as shown in Fig. 13 of our issue of Dec. 29, 1892, but we show herewith an adjustable plow, operated by compressed air from the brake reservoir, which was designed by Mr. J. E. Keegan, Master Mechanic of the Grand Rapids & Indiana R. R. This device is locally known as the "go-devil," and has been in use on that road for two winters with satisfactory results.

Four flat bars, A, 1×4 ins., are bolted to the bumper beam, and carried down to within 3 ins. of the rail level, being then bent back and inclined upward to have the rear ends attached to the cylinder casting. The inclined part of each bar is stiffened by a 4×4-in. tee iron, B, riveted to its upper side. The plow, C, is of the usual



PILOT SNOW PLOW OPERATED BY COMPRESSED AIR; GRAND RAPIDS & INDIANA R. R.

form, with overhanging nose and curved wings, extending well forward of the bumper and to a height of 18½ ins. above the rail. The sides are braced by 2×2-in. angle irons, and the bottom by 3½×3½-in. angle irons. On each side of the bottom is bolted an ice-cutting plow or flanger, D, consisting of a steel plate, ½ in. thick, with notched edges bent down so as to cut the ice and snow along the side of the rail. When in position for work, the ice plow is 3½ ins. below the top of the rail.

On the bumper beam are bolted two bearings for a 3-in. rocker shaft, E, carrying two rocker arms, F, connected by a 1⅜-in. rod, G. To this rod are hung two links, H, by which the heel of the plow is lifted (sliding vertically on the 4×1-in. bars, A), and a diagonal rod, J, which lifts the nose of the plow, and which is adjusted by means of a turnbuckle. A third and upright rocker arm, K, on the shaft, E, has a connecting rod, L, to the piston rod, M, of an air cylinder, N, placed behind the steam chest and supplied by a ¾-in. pipe.

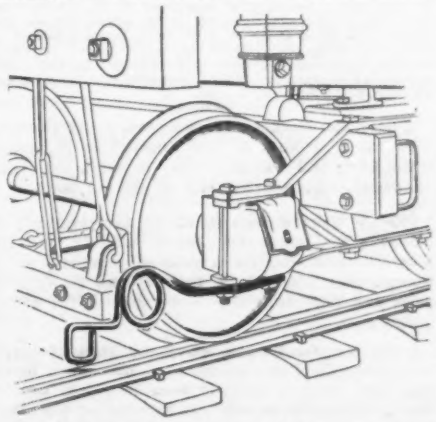
THE FULLER CONTROLLER HANDLE FOR ELECTRIC CARS.

The accompanying cut represents a new controller handle for electric cars, the special feature of which

is that by means of the loose section and the thumb screw the handle is clamped tight to the spindle, and any wear of the hole is taken up, so that the handle is never loose on the spindle. We are informed that this handle has been adopted by the Consolidated Traction Co., of Newark, N. J., after trials of various forms of handles. This handle is the invention of and is manufactured by Mr. E. A. Fuller, of East Orange, N. J., who may be addressed by any of our readers desiring further information.

CLARKE'S CAR WHEEL FENDERS.

In order to reduce the danger to life and limb to men working in freight yards, a number of roads are using the Clarke wheel fenders on their freight cars and switch engines and tenders, and one form of this fender is shown in the accompanying cut. The fender consists of a piece of spring steel bolted to the tie bar of the truck, or to the pilot or frame of the engine, and so shaped as to come close above the rail and directly in front of the wheel. The bottom is formed into a loop, placed obliquely across the rail, in order to prevent a man's limb or body from being struck by the wheel, and having a tendency to push any such obstruction off to the outside of the track. The coil is designed to provide for an ample lateral yield, in case of the fender striking a fixed obstruction. The fender is made in



Clarke's Fender for Freight Car Wheels.

different forms, the end loop being sometimes made considerably higher and a transverse gas pipe grab iron being used to connect the two fenders. These fenders are manufactured by F. H. Clarke, of Springfield, O.

LEGAL DECISIONS OF INTEREST TO ENGINEERS.

Corporation with Incomplete Organization has no Power to Contract.

A corporation which has issued no stock, and has received no stock subscription, has no power to contract, and a grant of franchises to it by a city is inoperative.—Aspen Water & Light Co. v. City of Aspen (Ct. of App. of Colo.), 37 Pac., 728.

Right of Riparian Owner to Land Covered by Water.

A riparian owner has a qualified right in the land covered by water on his front, to the line where the stream becomes navigable. A petition by a riparian owner for mandamus to compel a town corporation to regulate the line of deep water to which wharves may be built, alleging a demand on the corporation for a regulation of such line, need not allege a formal entry of the land covered by water on his front.—Wool v. Town of Edenton (Supr. Ct. of N. C.), 20 S. E. Rep., 165.

Liability of Municipal Corporations for Obstructed Streets.

A city situated in the latitude of northern Ohio is not bound, as a matter of law, to remove, even from its principal streets, snow which fell, during an unusual storm, to the depth of 4 ft.; and the fact that the snow has remained a week, and has been piled up by the street car companies in clearing their tracks, and

become frozen and hard, is notice to the public, as well as to the city authorities, as to its dangerous condition, and thereby the public is bound to exercise care in driving.—McDonald v. City of Toledo. (Circ. Ct., N. D., Ohio), 63 Fed. Rep., 60.

Operation of Ordinance as Contract in Erection of Telegraph Poles in Street.

A city ordinance, authorizing the erection of telegraph poles in the streets, required any company erecting poles under its provision to file an agreement permitting the city to use "the top cross-arm of any pole erected, or which is now erected," for telegraph purposes, free of charge. A company which had previously erected its poles in the streets filed the agreement required, and thereafter acquired and erected additional poles, and the city used many of the old and new poles. The ordinance, so accepted by the company, constituted a contract between the city and the company, which became executed when the city took the benefit thereof by using the poles; and the subsequent imposition by the city of a certain charge per pole for the use of the streets was a violation of the contract. —St. Louis v. W. Union Tel. Co. (Circ. Ct., E. D. Missouri, E. D.), 63 Fed. Rep., 68.

Gratifying progress is being made on the Chicago Drainage channel, according to the annual report of Chief Engineer Isham Randolph, presented at the meeting of the Board of Trustees, held Jan. 16. The total amount of material removed up to Jan. 1, 1895, on both main channel and river diversion work is given as 12,008,806 cu. yds. of glacial drift and 5,358,968 cu. yds. of solid rock, which is 48.6% of the entire amount of glacial drift and 43.57% of the entire amount of solid rock that must be moved. Up to Jan. 1 the sum of $8,438,254 had been paid out for construction work. The river diversion work is practically complete and plans have been prepared for the controlling works at Lockport. These controlling works will be a combination of lifting gates and a section of bear-trap dam, and are estimated to cost $160,000. In commenting upon the work the report says :

Although it is true that 44.48% of the entire work now under contract has been completed, yet it is also true that this percentage of progress is not spread evenly over the whole work. One of these sections is now in progress of reletting. Seven sections are now well, some of them largely, in advance of the progress requirements. Six sections are partially up to progress requirements. Ten sections are making such progress under the management that their completion on contract time may be regarded as an assured fact, and five sections are so much in arrears that there seems but little hope of their ever forging ahead and reaching progress requirements. These seemingly hopeless sections present questions as to the proper course of procedure, which demand the most serious consideration at your hands.

A telegraph block system has been in use since Jan. 2 on the New York & New England R. R. between Willimantic and Vernon, Conn., 19 miles, the regular train-order signals being used for the purpose.

The Baltimore & Ohio R. R. Co. has practically approved plans, made by Messrs. Baldwin and Pennington, architects, for a railway terminus at St. George, Staten Island. A ferry system between this point and New York city forms part of the contemplated plan.

A car transfer boat to carry car loads of beer in kegs from the Pabst brewery at Milwaukee to Chicago and other ports has been proposed, and Mr. Howe, the traffic manager, is reported as negotiating for the construction of the boat. The object would be to save the railway rates and the switching charges through Chicago.

The report of the President of the Lake St. elevated railway, Chicago, recently issued, contains the surprising statement that the present management, which came into office in July, 1894, had found, in addition to the bonded indebtedness of the road, a floating debt of $1,067,608, which was not on the general books of the company. To earn even the interest on the bonds issued at the date referred to required a total average of 50,000 passengers per day, on the basis of 60% for operating expenses, while the actual average number carried since March, 1894, to this date has been 27,135, or a little more than half the required number. The total bond issue up to the present time is $7,674,000. The report states that the interest charges for the ten months ending Dec. 31, 1894, amount to $284,730, and the net receipts for the same period $138,004, leaving a deficit of $146,725. To meet interest payments on the bonds now outstanding on the basis of 60% operating expenses, will require an increase of 90% in the average number of passengers carried, which is impossible in the present territory. The report then says that the situation is serious and pressing, and the management deem it imperative that a committee of the stockholders be appointed to confer with the bondholders and the officers and directors of the road, for the purpose of formulating some plan by which, if possible, a foreclosure of the mortgage and the appointment of a receiver may be avoided. The question of changing the motive power from steam to electricity is to be considered. The President's summary of the manner in which the road has been over-capitalized is interesting reading:

We found a structure comprising two tracks throughout, and three tracks in part, covering a distance of 6 miles 2,059 ft., along Market and West Lake Sts., and equal to 14 miles 1,301 ft. of single track, with reasonable equipment, and fitted with stations and office building. At a liberal estimate the 6 2.5 miles should not have cost over $2,017,000, to which should be added for right of way, reorganization and carrying charges, $500,000; miscellaneous expenditures, $200,000; rolling stock and other equipment, $600,000, making the total estimated cost, $3,317,000. For this we found the company had issued its 5% bonds, amounting to $6,500,000, of which there was in the treasury $257,000—making a total of $6,243,000. There was due the contractors for extras $350,000, and there was also issued in capital stock $10,000,000—amounting to $16,593,000.

The Belt Line railway, in Baltimore, Md., is fast approaching completion. One iron bridge over Jones Falls, built by the Pencoyd Bridge Co., is finished; but a second one needed cannot be constructed by the same company until some differences with the city are adjusted. The iron trough for the overhead electrical conductors are being put into the tunnel section by the Maryland Steel Co. The rails are being laid in the tunnel and the road is being ballasted. It is expected that the entire line will be equipped and ready for operation by April 1, 1895, excepting the station buildings, upon which work has not yet commenced.

The single-rail railway designed by Mr. Lina Beecher, and tried experimentally at Waterport, N. Y., consists of a track having a single T-rail with two guide rails 18 ins. apart beneath it. The car has two wheels in the center, bearing on the T-rail, and four horizontal guide wheels depending from the car frame, running upon the guide rails, these guide rails and wheels keeping the car upright when stationary or running at slow speed, and preventing its leaving the track, which is further accomplished by the under flanges on the guide wheels. When the car is running at a speed of over 10 miles an hour, the car is said to run on the two center wheels, only touching the guide rails occasionally with a swinging motion. The equipment of the experimental car consists of 50 cells of chloride accumulators and a 5-HP. slow-speed series-wound motor. The car complete weighs about four tons without passengers, and has a seating capacity for 24 persons. On a recent trial trip, carrying a load of 23 people, a speed of 19 miles an hour was attained with an expenditure of only 3¾ HP. The electrical equipment was designed and installed by M. H. Johnson, of Utica, N. Y. A contract has been given by the Waterport Electric Light & Power & Ry. Co. for the construction and equipment of four miles of this road, extending from Waterport to Lakeside. The structure will be upon single posts, and will be 12½ ft. above the surface, crossings at highways to be 15 ft., and at railways 18 ft. high in the clear. The road will be operated by water-power from Oak Orchard River at Waterport, where a dam 40 ft. high will be erected.

A new type of track construction for street and steam railways is being brought out by H. L. Stillman, of Kenyon, R. I. A flangeless T-rail is used, with the web set between the vertical backs of two longitudinal stringers of triangular section, the rail head resting on the stringers. Bolts are passed through the longitudinals and the rails, and at intervals there are flat tie-bars with threaded ends passed through the stringers. The longitudinals rest upon cross-ties about 10 ft. apart, and they are laid to break joint with each other and with the rail. The track has been tried experimentally.

A new bridge over the Charles River, Boston, is being considered by the Boston Transit Commission, the bridge to be situated between the Charles River bridge and the Fitchburg R. R. bridge. The city engineer, Mr. Jackson, recommends a plate girder bridge on masonry piers, to be 100 ft. wide, and having a clear headway of 14 ft. under the middle spans at mean high water; the roadway to be carried over the Fitchburg R. R. tracks in Charlestown, and the grades of the approaches not to exceed 3%. No draw is provided, and special legislation of Congress would be required for the construction of a bridge without a draw span.

The River Thames, between the Tower of London and Richmond, is crossed by 28 bridges, 11 of these being railway bridges.

A bill is before Congress asking for permission to erect a bridge across the Niagara River to connect Grand Island with the mainland.

Plans for the Paris Exposition of 1900 are now due, and so far 108 projects have been sent in to the architectural competition lately held in Paris. A prize of $10,000 is offered for the accepted plans. The Eiffel Tower must necessarily be included in all projects and, says "L'Illustration," it has given rise to all sorts of fantastic and extravagant propositions to decorate or change its form; one architect even proposing to convert it into a tall and slender maiden and another proposing to make of it a hotel with a thousand rooms. The list of absurdities presented is only rivalled by those proposed for the Chicago Exposition and Chicago influence is shown in one plan which proposes to cover the Seine and the Champ de Mars with 20-storied structures. Another transforms this parade ground and the garden of the Trocadero into lakes and erects in them two volcanoes, Etna and Vesuvius. Two gigantic elephants enter in one scheme; these elephants face each other and unite their trunks at a height of 244 ft. above the ground and support a tower 475 ft. high, surmounted by electric lanterns. Curious visitors may ascend to the top by way of cars running through the trunks of the elephants. Among the projects, however, are about 40 of a first order of merit, and from among these a final plan will probably be evolved.

The erection of the great wheel in London, built on the principle of the Ferris Wheel, differs somewhat from the method described in our issue of Nov. 29, according to a published statement by the engineer, Mr. Walter B. Besset, of Maudslay, Sons & Field, London. The wheel is composed of 40 segments, not 39 as stated, and the first 10 segments were erected vertically, not 20 as stated, as to have put on 20 segments and haul round out of the way in the manner proposed would not have been a safe operation. After building the first 10 segments on one side, they proceeded to build 10 on the other, but in this case by the aid of staging which ran up to a height of 150 ft., that is to say, the height of the axle. The next 10 segments were put on by hauling round the wheel and adding a segment at the top of the towers as the preceding segment was hauled out of the way. The last 10 segments were put on by building up a portion of the periphery sufficient to form a strut to carry the enormous weight of the overhanging portion; after that the wheel was hauled round and built in the same manner as the third quadrant.

A plan for improving the Chicago lake front will soon be presented to the Council of that city, according to the newspapers. The present so-called Lake Front Park is a strip of land about 310 ft. wide, extending from Randolph St. on the north to Lake Park Place, fronting the Illinois Central R. R. station, and is a little over one mile long. Just east of this land are the tracks of the Illinois Central R. R., lying at a level slightly below the surface of the park, and for years there has been talk of devising some plan whereby these tracks might be depressed in such a way that an opportunity might be had for the full development of the handsome lake front for park purposes. The present plan proposes at first the extension of the land between Randolph and Jackson Sts. 1,350 ft. out into the lake by filling with material from the Drainage Channel and the proposed new water-works tunnel, and then the gradual extension of this new land south from Jackson St. to Lake Park Place. The Illinois Central R. R. tracks are to be lowered a couple of feet and high retaining walls will be built at each side of the right of way, with the filling carried nearly to their tops, or, in other words, the tracks will be depressed by elevating the level of the land bordering them. For the purpose of communication between the two parts of the new park, bridges are to be built over the railway tracks. It is argued that by the use of the earth from the Drainage Channel and the new tunnel work, the filling can be done at a very small expense.

Three new battleships are provided for in the naval appropriation bill approved by the House committee on naval affairs, and soon to be reported. These vessels would cost not over $4,000,000 each, and would be provided with armor and armament equal to any vessel afloat. The same bill provides for twelve new torpedo boats of from 100 to 300 tons each and costing on the average $170,000 each. One of the battleships and three of the torpedo boats are to be built on the Pacific Coast, provided this can be done at a fair cost. Speed premiums are abolished under this bill, which appropriates $5,287,670 for armor and armament for vessels already authorized; $8,342,422 for hulls, outfits and steam machinery, and $125,000 for the completion and equipment of vessels, making $13,755,092 for the increase in the navy authorized. Including appropriations for navy yards, pay of the navy, supplies of all kinds, Naval Academy, etc., the total appropriation asked for amounts to $31,881,000, an increase of $5,000,000 over that for the current year. The enlistment of 1,000 additional men is authorized, one-half the number asked for by Secretary Herbert.

The alleged defective armor-plates on certain U. S. ships of war are not to be taken out and submitted to a ballistic test, as proposed in the Cummings resolu-

tion. The Senate Naval Committee has pidgeon-holed the resolutions, and this ends the matter for this Congress, though the Carnegie Steel Co. has offered to bear all the expense of removing and retesting the plates reported as doubtful.

The Bethlehem Iron Company's Russian armor contract amounts to from 1,200 to 1,500 tons, as announced in our issue of Dec. 20. According to late press items 1,200 tons is to be 16 ins. thick and 300 tons will be 7 ins. thick. The contract calls for the delivery of 600 tons at St. Petersburg in seven months from receipt of drawings, but the company thinks it can deliver 900 tons in that time. The armor plate will not be Harveyized. Proposals were received from 15 firms by the Russian government, including four French, three English and two German armor-making establishments. The transaction was carried out by Lieut. J. F. Meigs, armor expert for the Bethlehem Company.

The Trans-Siberian railway as announced by the Russian Government will be opened in 1901, instead of 1904, as indicated by General Annenkoff in his report. The government expects to join the Russian railway system with Irkoutsk in 1898, and in the same year to complete the Lake Baikal section. The line along the Amour will also be finished sooner than expected as the work is advancing rapidly. The Vladwostock and Kabarowko sections will be opened in 1896, and the Ussuri section was finished on Oct. 13 last as far as Ussuri. "Le Genie Civil" says that this great activity is putting new life into the American project for a Portland-Alaska railway ultimately to join the Russian system. Thus it is that we have to go abroad to get the news!

The Liverpool docks are to be improved by the addition of a new deep water landing stage for Atlantic line steamers, so as to avoid the use of tenders, as at present, and on this will be a railway station, so that passengers may go direct from the steamers to the trains. This work, with further dredging of the bar, will cost about $200,000.

The improvement of the canals is considered in the annual report of the State Engineer and Surveyor of New York, and vertical lift locks are recommended at Lockport, Cohoes and Newark, that at Cohoes superseding the present 16 consecutive locks at that place. The Milligan electrical towing device is also considered, which consists of a 20-HP. motor running along a single-rail track over the towpath, the motor hauling the boat by a tow line and being controlled by a cord from the boat.

A Lake Erie-Hudson River canal scheme is being promoted by Mr. Chauncey N. Dutton, of Pittsburg. He proposes a canal around Niagara Falls to Lake Ontario, 8 miles long, and to cost from $8,000,000 to $10,000,000. His route would then be laid through the lake and down the St. Lawrence River to Cornwall; across from Cornwall to Lake Champlain, and down that lake and across to the Hudson River. He estimates the total cost of his project at $100,000,000, and would only ask Congress for a charter, without further aid from the government. Mr. Dutton will probably labor some time yet before he will commence the construction of his canal.

The North American Canal Co. is the name of a corporation said to have been incorporated in Canada to build a canal from Lake Erie to the Atlantic. It must obtain the consent of Congress for work on American territory. As announced, the project includes the use of the Welland Canal as far as Thorald; from there to Queenstown, 8 miles, a canal with 3 locks would supplant the 25 locks of the Welland Canal. These new locks would be 500 ft. long, 65 ft. wide and 26 ft. deep. The route would be then by the Welland Canal to Lake Ontario; down the St. Lawrence, and through a 40-mile canal connecting Lake St. Francis with Lake Champlain; and then by a 25-mile canal to the Hudson River. The total distance from Lake Erie to New York would be 720 miles, including 91½ miles of canal.

For the Galveston jetty-work $1,100,000 was asked by the officers in charge. The urgency deficiency bill, which has just passed the U. S. Senate, appropriates $200,000 for this work.

The Atchison bridge over the Missouri River at the town of that name is being greatly endangered by the encroachment of the river. A canal is now being dug to divert the stream through the island above the town. This canal will be over one mile long and about 70 ft. wide. Its construction involves the removal of 167,000 cu. yds. of material.

Wisconsin has a geological survey bill before its legislature, which contemplates the completion of its geological survey; a study of the soil, plants and animal life of the state and the completion of the topographic map commenced by the U. S. Geological Survey.

Iceland, says an Icelandic contributor to "Good Roads," is a country without roads or bridges, and as a consequence without wheeled vehicles. For communicating in the country the hardy ponies alone are depended upon. An attempt has been lately made by the Althing, or Parliament, to introduce road-making by importing an engineer from Norway, but owing to limited means little is yet done. Some money has previously been wasted in that direction under the superintendence of an Icelander who had never been out of the island, and had thus never seen a properly constructed road. He made some roads wide enough only for two ponies to pass, instead of building them broad enough to accommodate wheeled vehicles, which is what the Icelanders now want.

Storage batteries have been tried with "very satisfactory" results by the Berlin Tramway Co., says "Le Genie Civil." Each car carried a Hagen accumulator weighing 6,160 lbs. Each element was formed of 21 electrodes, weighed 70.4 lbs., and there were 88 of them. The batteries are placed under the seats, as usual, but they are charged at the station and placed in the cars by means of rollers as the exhausted ones are removed. The time required for charging is about 2½ hours, and this is sufficient for a four hours' run, at an average speed of about 7½ miles per hour. Each car carries 30 passengers, and both ordinary and electric brakes are provided. This exhibit would hardly be called satisfactory by American street railway managers.

Electrically-lighted private carriages, says U. S. Consul Chanceller, of Havre, are now extensively used in Europe. The storage battery is placed under the driver's seat in a box 8 × 7 × 4 ins.; it supplies nearly 8-c. p. light for from "one to two months, and costs from 50 cts. to $1 to renew the charge." The lights are used both on the outside and inside of the carriage, and on special occasions the harness is decorated with small incandescent lights in colored glass bulbs.

A balloon, thoroughly equipped for an ascent of 10 miles, is proposed by Prof. Henry A. Hazen, who has for years made a close study of aerial phenomena. The problems he would propose to solve, or assist in solving, are those of temperature at this height, now variously estimated at from 100° to 250° below zero; the color of the sun, now absolutely unknown; the process of heat radiation and the extension of our knowledge of electrical influences upon temperature, and the movement of storm areas. Professor Hazen has planned a steel, air-tight car, to hold the observer and the scientific apparatus, lighted with electric light and provided with apparatus for generating gas for the balloon. High-pressure reservoirs of pure oxygen would be depended upon for renovating the air, and a heating apparatus will also be provided. The cost of such an enterprise would be great, and either the Government or the wealth of scientifically disposed citizens would have to be relied on to furnish the necessary means.

The great 2,500-HP. engine built by the E. P. Allis Co., of Milwaukee, Wis., for the power plant in the Machinery Building of the Columbian Exposition is now at work in the power house of the Kansas City Cable Ry. Co. at Eighth St. and Woodland Ave., Kansas City, Mo. It drives the main cable, which is about 94,000 ft. long, weighs 2½ lbs. per ft., and runs at about eight to ten miles per hour. A new fly-wheel has been fitted to the engine on account of the great variation in the power, ranging from 350 to 1,000 HP. This wheel is 32 ft. diameter, weighs 110 tons and makes 40 revolutions per minute. The engine was described and illustrated in our issue of Aug. 24, 1893.

The financial status of the imperial railways of Austria is for the first time set forth in the budget for 1895. According to this official document the cost of establishing 4,235 miles of railway is represented by a capital of 1,100,000,000 florins, say $440,000,000; an average of about $103,000 per mile. The operation of this system will give, at budget valuations, for 1895 an estimated net profit of $11,364,000, or about 2 3-5% on the capital. The purchase of the railways from the old companies, however, imposes upon the State an annual charge of $15,652,000 for interest and extinguishment of title. Further than this, the State has directly borrowed for railway purposes $110,280,000, which, at 4¼%, imposes an annual interest charge of $4,680,000. The annual charge on account of the railways thus mounts up to $20,332,000, and the State operates its railways at an annual loss of $8,968,000.

The further improvement of the League Island Navy Yard, at Philadelphia is being urged by Congressman Bingham, of that city. Mr. Bingham asks to have the law amended which now requires that only 80,000 cu. yds. each month of the material now being dredged in improving the harbor of Philadelphia be deposited within the limits of League Island. The contract for this harbor work reserves the right to require the contractor to deposit 5,500,000 cu. yrds. of the removed material within the limits of the Navy Yard, and Mr. Bingham claims that the additional cost of requiring this filling, about $850,000, would be more than offset by the consequent improvement of the government property. So far 2,355,000 cu. yds. have been so deposited, at a cost to the government of about 12 cts. per cu. yd.

The bridge project for connecting Boston and Charlestown is now before the Boston Rapid Transit Commission. A number of plans have been presented, including high and low bridges, a one and a three-bridge plan, and single and double-deck bridges. The hearing is now closed as far as petitions for and against a new bridge are concerned.

The ventilation of tenement houses was taken up at the recent meeting of the American Society of Heating and Ventilating Engineers, and the president, Mr. E. P. Bates, suggested that legislation be secured to compel every person or corporation who shall in the future erect a tenement house to connect each room with an individual ventilating flue, to be not less than 8 ins. internal diameter, and preferably of glazed tile, built in the wall of the building.

Lowell may follow Lawrence in adopting sand filter beds for purifying its water supply from the Merrimac River. It is reported that Mr. Robert J. Thomas, Superintendent of the Lowell water-works, has recommended that a 5,000,000-gallon sand filtration plant be constructed, and that steps should be taken after that to secure water from some other source. Extensive experiments on a practical scale have been made in the development of a driven well supply, but it seems that local conditions are not favorable for a supply sufficiently great for so large a city. Since the Lawrence filter beds (see Eng. News, Aug. 3, 1893) were put in operation, in the latter part of 1893, similar beds have been built at Mount Vernon, N. Y. (Eng. News, Aug. 23, 1894), and a filter plant, which is said to be after the same general design, is just about ready for operation at Grand Forks, N. D.

The total length of the electrical conduits of all kinds in the city of Brooklyn at the close of 1894 was 16,772 miles, according to the report of the subway commissioners. Of this total 9,389 miles are underground. Mr. John A. Barrett, Electrician, reports to the board on his investigations of the electrolysis of underground metal caused by the trolley currents. Potential measurements have recently been made by Mr. Barrett at 660 hydrants with a view of locating the danger districts.

A large sewer outfall pipe was recently sunk to the bottom of the Rhine, as part of the sewerage system of Cologne, Germany. The pipe is 590 ft. long and has a diameter of 47½ ins. The total weight is 132,000 lbs. It is built in 20 sections of ⅜-in. open hearth steel plates. For the purpose of sinking the pipe, a trestle was built into the Rhine on which the separate lengths were assembled and riveted together. The tube was given a priming coat of hot linseed oil and two coats of a mixture of turpentine oil and coal tar. The pipe was sunk by means of 15 racks, and precautions were taken to lower uniformly on all racks. From the sewer, the bottom of which is 8 ft. above the shore, a steep incline leads to the pipe. The bottom of the latter is on datum near the shore and descends on a grade of 1%. The pipe rests on a bed of gravel and broken stone and will be protected by a covering of heavy riprap.

The shipments of standard steel rails for 1894 are said by the "Iron Age" to have amounted to 722,600 tons, of which 66,600 tons were the product of the Colorado mill which is not in the combination of rail mills. This total does not include light rails, street rails or girder rails, and shipments of the latter were relatively heavy.

Tar-macadam street paving is used extensively at Withington, England, and is described in a recent paper by Mr. A. H. Mountain, Surveyor. A 10-in. bed of hard clinkers and broken stone is well rolled by a 12-ton steam roller, and covered with 4 ins. of 2½-in. broken stone, which is also well rolled. Upon this is laid a 3-in. layer of "tar-macadam," consisting of one ton of 1½-in. granite to 12 gallons of tar, 28 pounds of pitch and 2 gallons of creosote oil. This coat is well rolled, and is covered with 1 in. of limestone screenings mixed with the same cementing ma-

terials, then covered with a blinding of dry screenings and finally rolled. The work should only be done in fine weather, the rolling should average one day's work for each 100 sq. yds., and the traffic should not be let on the road directly after it is completed. The cost is from 84 cts. to $1 per sq. yd.

The history of the truck, or "bogie," has been investigated by Mr. Clement E. Stretton, C. E., of England, and is traced back to four-wheel cars used in pairs to carry long timbers and iron bars on the Merthyr-Tydvil tramway, South Wales, as early as 1800, the ends of the timbers resting on bolsters to which the trucks were pivoted. Some English locomotives of 1815 are also instanced, and Mr. Stretton says that two engines with two four-wheel trucks each were in use in England for 15 years before their introduction into America by Mr. Jervis in 1830, but that the use of these trucks was not understood or appreciated, and they were therefore abandoned in 1830 in favor of the rigid wheel-base system, which has been a distinctive feature of European engines until recent years.

An express locomotive recently built at the Rochester shops of the Buffalo, Rochester & Pittsburg R. R., from the designs of Mr. C. E. Turner, Superintendent of Motive Power, is fitted with an electric headlight, current for which is furnished by a small motor at the back of the lantern. The engine is of the eight-wheel type, with cylinders 18 × 24 ins.; driving wheels, 5 ft. 8 ins. diameter; and weighs about 50 tons, or 85 tons including the tender. All steam connections in the cab are attached to a main header, so that only one opening to the boiler is required.

ANNUAL MEETING OF THE OHIO SOCIETY OF SURVEYORS AND CIVIL ENGINEERS.

The sixteenth annual convention was held at Cincinnati, O., Jan. 15 to 18, 1895. The meetings began on Tuesday evening, Jan. 15, when Mr. J. A. Caldwell, Mayor of Cincinnati, delivered an address of welcome, which was followed by an address by Mr J. M. Harper, President of the Society.

Wednesday morning the report of the secretary was presented and showed a membership of 130, and a balance of $167.78 in the treasury. Amendments to the constitution were adopted, classifying the membership into active and associate, and extending the privileges to mechanical engineers and architects.

The report of the Committee on Drainage commended the change in the laws of the state in regard to the construction of ditches and called attention to the fact that the law regarding cleaning out of ditches could hardly be worse than it now is. Reference was made to the project for straightening the Great Miami River for a distance of 12.7 miles, beginning at or near the Lewiston Reservoir. This will drain 2,000 acres of waste land, and is of great importance to 250 square miles of water-shed. The excavation is estimated at 170,000 cu. yds. Col. Latham Anderson, of Cincinnati, read a paper on "Garbage Disposal," in which the he recommended a house-to-house collection as often as twice a week; the garbage to be kept in air-tight pails and collected at fixed hours, and the pails and carts being thoroughly disinfected after the garbage is dumped. He objected to the system of purifying garbage by chemicals, and considered incineration to be much cheaper, stating that garbage furnaces have given entire satisfaction in every city in which they are used, and citing Terre Haute, Ind., as a model city in this respect. The paper brought out some discussion on sewage disposal. On Wednesday evening Hon. Martin Dodge, Chairman of the Ohio Road Commission, made an address on the road problem, in which he called special attention to the economic features of road improvements, by which the value of land is increased. Where transportation is high, wages are low. He contended that the electric railway can be built for less than the stone road, and that the cost of transportation on the former will not exceed 5 cts. per ton-mile, while on the latter it is 25 cts. per ton-mile. He believes that the electric road will come into general use for transporting products of the farm, etc., to towns for distances not exceeding 30 miles, and will supersede, to a great extent, the transportation by wagons. This argument was discussed at some length, and its fallacies pointed out, in Engineering News of Jan. 11, 1894.

Mr. F. A. Bone, of Lebanon, O., presented a paper giving the methods of road construction practiced in Warren County. This brought out discussion on the value of sub-drainage for road construction, as well as various forms of cross-section of roadbed. Prof. S. B. Newberry, of Sandusky, O., read a paper on "Practical Notes on Concrete." He stated that the matter of correct proportions of cement, sand, broken stone, etc., is one which requires some thought and calculation, and by proportioning these ingredients correctly, an immense saving in cost and increased strength can be secured. The chief object in compounding concrete is to produce a compact mass, as free as possible from pores or open spaces; in short, to imitate solid rock as closely as possible. Cement is very costly in comparison with the other ingredients of concrete, and must not be used wastefully, a little cement judiciously used being better than a large quantity thrown in recklessly. To produce a compact mass, the voids must be filled; hence, the use of materials of different size in the making of concrete. He found that briquettes of cement, with 3 parts sand and 4 parts gravel, showed higher tensile strength at 28 days than those made with 3 parts sand only. The following table gives the relative weights of a given volume of different materials, and also the percentage of voids, as determined by him:

Weight of Unit Measure and Percentage of Voids in Various Materials.

	Weight of 1 litre.	P. c. of voids.
Portland cement	1,720 g.	...
Louisville "	...	...
Sandusky Bay sand, not screened	1,780 "	32.3
" " " through 20-mesh screen	1,630 "	38.5
Sandusky Bay sand, 20-30 mesh (standard sand)	1,570 "	40.7
Gravel, ¼ to ½ in.	1,510 "	42.4
" ¼ to 1-20 "	1,680 "	35.9
Marblehead broken stone (chiefly about egg-size	1,380 "	47.0

These figures illustrate the importance of screening any of the materials used in making concrete. The presence of clay in sand is objectionable, not because of its fine state of sub-division, but because the clay coats the sand particles and prevents the adhesion of the cement. From these figures he considered that a concrete of 1 cement, 2½ sand and 6 gravel would probably give the best results, and little or no improvement would result from increasing the proportion of cement. A similar calculation showed that the correct proportions for a concrete made of sand and broken stone given in the table would be 1 to 3 to 6½, but probably 1 to 2½ to 5 would be found to give the best results in practice. The concrete will be practically compact and non-porous, but if made from Portland cement it would be expensive and unnecessarily good for ordinary work. He therefore recommended for ordinary work Portland cement 1, sand 5 and stone or gravel 10; or even 1 to 7 to 14. He stated that when very strongly rammed into place, the volume of concrete obtained from correct proportions of the material will be about 10% more than the volume, and 1 cu. ft. of cement, 2½ cu. ft. of sand and 5 cu. ft. of stone will therefore yield about 5½ cu. ft. of concrete.

Prof. W. E. Myers, Ada, O., presented a paper on "The Engineer as a Factor in Civilization," and Mr. J. A. Hanlon, of Coshocton, O., read a paper on "Riparian Rights." Mr. H. C. White, of Warren, O., presented a paper on "Sidewalks," in which he spoke of the difficulty encountered in establishing grades for sidewalks on streets already occupied by old walks and already built up. The discussion elicited the fact that it was a practice in many localities not to lower the sidewalk to conform with the grade of the center of the street when to do so would damage the adjacent property.

The members were entertained Thursday evening at the rooms of the Cincinnati Engineers' Club. Mr. D. M. Burke, President of the Club, making an address of welcome. Mr. H. J. Stanley, Engineer of the Board of Administration of Cincinnati, gave the society an account of some of the public works of the city; of the grades used in the various street improvements, and a description of the material used in street pavements, stating that granite blocks and asphalt are used on streets subject to the heavier traffic, and brick (to some extent) upon the streets subject to lighter traffic. The bricks found most durable are the shale brick, and he thought that too much haste in manufacture is injuring the quality of street paving brick. The mixing should be thoroughly done, and longer time allowed for burning and cooling than is usually allowed. Boulders are used on streets where the grade is too heavy for asphalt, granite or brick. Granite and limestone are used for curbing and gutter stone. Curbs are from 5 to 6 ins. thick and 21 ins. deep. The city has a total of 308.67 miles of improved streets, 198.03 miles of unimproved streets and alleys, 133 miles of street-railway tracks and 165 miles of sewers. The combined system is used and about two-thirds of the sewers are of pipe and the remainder brick and stone; pipes are from 24 ins. to 12 ins. diameter, the latter being the smallest sewer laid, while the largest sewer is 19½ ft. diameter. The city has hundreds of miles of brick sidewalks, some freestone, and is pushing the laying of artificial stone walks. Mr. Stanley then outlined the organization of the Engineering Department of Cincinnati, which is said to be the best arranged of any city engineer's office known to the members of the society.

On Friday morning Prof. E. A. Kemmler, Assistant Professor of Civil Engineering, Ohio State University, submitted an able paper on "Surveying by Photography," in which he reviewed some of the work which has been done in the application of photographic methods of surveying and architecture, and offered some suggestions as to the future possibilities of which photographic surveying is susceptible in lines which have not been tried extensively as yet. The extreme simplicity of the details of reduction makes the method one of which every surveyor may avail himself when necessary, and as photography is now included in scientific and technical education, many engineers possess sufficient knowledge to manipulate the camera and develop the plates. In addition to the cost, methods of operation, etc., he discussed the accuracy of the method as compared with transit and tape, compass and chain, stadia, plane-table, etc. The report of the Committee on Surveying was presented by Mr. Hosea Paul, of Cleveland. The report of the Committee on Solar Attachments was presented by C. S. Howe, Professor of Mathematics and Astronomy, Case School, Cleveland. This committee experimented with solar instruments made by Gurley, Buff Berger and Saegmuller, and found that the adjustments of solar attachments are long and difficult to make, and must be frequently examined, and that to secure the best results the instruments must be frequently tested on a known meridian line. From the results of their experiments they conclude that errors of 1 minute, or even 1½ minutes, either way are not infrequent, and any single observation would be uncertain to this extent, but the mean of 20 or more observations ought to be within less than ½ minute of the meridian. After an instrument was set up, it was found that 20 observations could be made in less than half an hour, 15 minutes being the usual time taken by the committee.

Dayton was selected as the place for holding the next annual meeting, in January, 1896. The following officers for 1895 were elected: President, John L. Culley, Cleveland; Vice-President, F. M. Turner, Dayton; Secretary and Treasurer, C. A. Judson, Sandusky.

ANNUAL MEETING OF THE MICHIGAN ENGINEERING SOCIETY.

The 16th annual convention of the society was held at Lansing, Mich., Jan. 15, 16 and 17, with a fair number of the members present. Nearly 20 papers were read in full or by title, some of which were of unusual engineering interest. The first session was opened Tuesday afternoon, Jan. 15, and the reading of papers was begun at once. The first paper presented was by Mr. H. C. Thompson and described in a general way the construction and use of logging railways in the Michigan forests, but touching considerably more upon the advantages and economy of these roads than upon the methods of construction. This paper was followed by a long paper entitled "Riparian Rights," by Mr. J. J. Watkins, which was of considerably more interest to the surveyor than to the engineer. The author held, and attempted to prove, that the federal laws should hold in the continuation of lines under water in preference to the common law. These papers were followed by "Somes Notes on Highway Grades," by Mr. John Randall; "Mineral Resources of Northern Arkansas," by Mr. E. L. Hayes; "Grand Rapids Plaster Quarries," by Mr. C. H. Redman, and "Some Details of Sewer Construction," by Mr. F. F. Rogers.

Wednesday's session opened with an unusually valuable and carefully prepared paper on "Water Waste," by Mr. G. S. Williams, Superintendent Water-Works, Detroit, Mich. We hope to give the substance of the facts brought out in this paper in a future issue. Mr. Williams' paper was followed by a brief talk by Prof. C. E. Green on the precipitation at Ann Arbor, Mich., and its bearing on underground sources of water supply for Southern Michigan towns. After this came papers on "Rights to Land by Possession," by Judge F. A. Hooker, of the Michigan Supreme Court, and "Some Difficulties of Manufacturing," by Mr. C. E. Bement. In place of the evening session an informal social and smoking party was held in the hotel parlors.

At Thursday's session the reading of papers was continued by a very interesting paper on the "Masonry of the Soo Canal Lock," by Mr. J. L. Callard, U. S. Assistant Engineer in charge of the lock construction. A full description of this important structure will appear in these columns during the present year.

The business affairs of the society were shown by the secretary's and treasurer's reports to be in good shape although the extension of the work of the society into new fields had been hampered by lack of funds. In view of this it was voted to increase the annual dues from $2 to $3 per year.

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PERSONALS.

Maj. Joseph W. Paddock, Government Director of the Union Pacific Ry., died recently at Omaha, Neb.

Mr. G. B. McCormack has been appointed General Manager of the Tennessee Coal, Iron & Railway Co., with offices at Birmingham, Ala.

Mr. C. A. Swineford, formerly Superintendent of the Madison Division of the Chicago & Northwestern Ry., died at Baraboo, Wis., Jan. 18.

Mr. S. Z. Earle, of Marshfield, Ore., has resigned his position as Chief Engineer of the Coos Bay, Roseburg & Eastern R. R. & Navigation Co.

Mr. W. H. Sheldon, Vice-President and General Superintendent of the Poughkeepsie & Eastern R. R., died at Poughkeepsie, N. Y., Jan. 19.

Mr. J. M. Harris, of Holcomb's Rock, Va., who died Jan. 10, was for many years engineer and superintendent of the James River & Kanawha Canal.

Mr. B. T. Wheeler, Assistant Chief Engineer of the New York, New Haven & Hartford R R., has been appointed Superintendent of Streets at Boston, Mass.

Mr. A. J. Gibbons, Engineer of Maintenance of Way on the Terre Haute & Indianapolis R. R., with office at Terre Haute, Ind., has been appointed Chief Engineer.

Mr. D. C. Dunlap, M. Am. Soc. C. E., Assistant Superintendent of Construction of the Chicago Drainage Canal, has resigned, and the position has been abolished.

Mr. Barr Ferree has been elected an honorary corresponding member of the Royal Institute of British Architects, being the fifth American architect to receive this distinction.

Mr. G. E. Otis, Locating Engineer of the Choctaw, Oklahoma & Gulf Ry., has been appointed Principal Assistant Engineer, with headquarters at South McAlester, I. T.

Mr. A. C. Titus has been elected Chief Engineer of the Gulf & Interstate Ry., of Kansas. Mr. A. H. Wetherbee is Assistant Engineer. The offices are at Topeka, Kan.

Mr. W. C. Downing has been appointed Engineer of Maintenance of Way of the Terre Haute & Indianapolis R. R., with office at Terre Haute, Ind., vice Mr. A. J. Gibbons, appointed Chief Engineer.

Mr. H. Prouty has been appointed by Mayor Hopkins, of Chicago, as consulting engineer, to consider plans for preventing accidents in the tunnels of the cable railways. The dangers of these tunnels were commented upon in our issue of Dec. 27.

Mr. F. L. Corwin has been appointed Superintendent of the Breckenridge Division of the Great Northern Ry., with headquarters at Wiemar, Minn., vice Mr. J. M. Barr, appointed General Superintendent of the Western Division, and Mr. V. A. Riton has been appointed Superintendent of the Cascade Division, with headquarters at Leavenworth, Wash.

Mr. Edward Canfield, M. Am. Soc. C. E., Chief Engineer of the New York, Ontario & Western Ry., has been appointed General Superintendent, vice Mr. Joseph P. Bradfield, who has resigned to accept the appointment of Superintendent of the Syracuse & Buffalo Division of the New York Central R. R.

Mr. N. D. Miller, Chief Engineer of the Great Northern Ry., has resigned, and Mr. John F. Stevens, M. Am. Soc. C. E., Assistant Chief Engineer, has been appointed to succeed him. Mr. Miller became Locating Engineer of the road in April, 1879, Engineer of Bridges and Buildings (as well as locating engineer) in 1880, and Chief Engineer in 1885.

Mr. W. B. Stearns, M. Am. Soc. M. E., formerly Assistant Engineer and later Purchasing Agent for the Berlin Iron Bridge Co., has resigned to accept a position with the Pennsylvania Steel Co., at Steelton, Pa., and the Maryland Steel Co., Sparrows' Point, Md.

Prof. Henry B. Nason, a member of the faculty of Rensselaer Polytechnic Institute, died at Troy, N. Y., Jan. 18. He was born at Foxborough, Mass., in 1831, graduated at Amherst College in 1855, and later studied at the University of Gottingen, Germany. He was appointed professor of natural history at the Rensselaer Polytechnic Institute in 1858, and professor of chemistry in 1864, retaining both positions until his death. In 1876 he was appointed by President Hayes as juror for the United States in the department of mineralogy and metallurgy at the Paris Exposition. He was member of a number of scientific societies and author of several treatises on technical subjects.

Mr. Alexander H. Bauer, M. Am. Soc. Elec. Engs., electrician of the Pullman Palace Car Co. at Jersey City, N. J., died in New York, Jan. 15, at the age of 48. He was born at Baltimore, Md., in 1848, was for several years a telegraph operator and later was manager for the Gold & Stock Telegraph Co., of Baltimore, and the Mutual Union Telegraph Co. In 1882 he became electrician of the Viaduct Manufacturing Co., Relay, Md., and the next year went to England to study storage batteries. In 1885 he became the Boston manager of the Baltimore & Ohio Telegraph Co., and two years later went with the Pullman Car Co. A system of lighting trains by electricity by means of an engine and dynamo in the baggage car was devised by him, and has been used for several years on the Pullman service.

Dr. Robt. H. Lamborn, who died in New York city, Jan. 14, from heart failure, was born near Kennett, Pa., in 1835, and studied at the universities of Giessen and Freiburg, Germany. In his early life he was connected with the engineering department of the Pennsylvania R. R. He was the first secretary of the American Iron and Steel Association; was active in the organization in 1866 of the Pennsylvania Steel Co., and was its treasurer for several years. He was secretary and treasurer of the Lake Superior & Mississippi R. R. in 1869, and until its completion from St. Paul to Duluth, He was Managing Director of the Colorado Coal & Iron Co., from 1880 to 1883, when its steel plant was built at Pueblo, Colo., and was also at one time Vice-President of the Denver & Rio Grande R. R. He was the author of works on the metallurgy of copper and lead.

Mr. John B. Smith, President of the Erie & Wyoming Valley R R. and General Superintendent of the mines of the Pennsylvania Coal Co., in the northeastern part of Pennsylvania, died at his home in Dunmore, Pa., Jan. 16. He was born in Sullivan county, N. Y., June 7, 1815, and in 1831 he entered the machine shops of the Delaware & Hudson Canal Co. From 1848 to 1850 he was draftsman and superintendent of machinery for the Pennsylvania Coal Co., and since 1850 he had been General Superintedent for that company. He introduced three-cylinder engines for hauling coal trains up the inclined planes, the object being to get a more uniform turning moment on the shaft and prevent the rope from slipping on the drum. Later he successfully applied the system to several locomotives, drawings of which we have already in hand and shall publish shortly.

Mr. S. R. Callaway, Receiver of the Toledo, St. Louis & Kansas City R. R., has been appointed President of the New York, Chicago & St. Louis R. R., vice Mr. D. W. Caldwell, who will devote himself exclusively to the Lake Shore & Michigan Southern Ry. Mr. Callaway began his service in 1863 in the office of the Grand Trunk Ry. From 1869 to 1871 he was Chief Clerk to the Superintendent of the Great Western Ry. of Canada, and from 1871 to 1874 private secretary to the General Manager of the same road. From 1874 to 1878 he was General Superintendent of the Detroit, Saginaw & Bay City R. R.; from 1881 to 1884 General Manager of the Chicago & Grand Trunk Ry., and President of the Chicago & Western Indiana and Belt Line companies. In 1887, Second Vice-President and General Manager of the Union Pacific Ry., and in September, 1887, became President of the Toledo, St. Louis & Kansas City R. R., of which he was appointed Receiver last year.

Prof. Hiram A. Hitchcock, Associate Professor of Civil Engineering in the Thayer School of Civil Engineering of Dartmouth College, died of pneumonia at his home, Hanover, N. H., on Jan. 18, at the age of 37 years and 8 months. He was born in Boston in 1857, and graduated from the Chandler Scientific School of Dartmouth College, Hanover, N. H., in 1879, and from the Thayer School of Civil Engineering in 1881. He served as draftsman in the offices of the New York, West Shore & Buffalo R. R., and later in the Delamater Iron Works. He became an instructor in the Thayer School in 1883, and was afterward made a professor, working chiefly in the departments of Surveying and Applied Mechanics. He was civil engineer for the Railroad Commissioners of Vermont on their tour of annual inspection in 1889, and was a member of the board of engineers which examined the plans and estimates for the Nicaragua Canal in the same year. Prof. Hitchcock was a man of varied tastes and acquirements outside of his more strictly professional work, having devoted considerable study to microscopy and biology, for which he fitted up a laboratory at his home. He was a nephew of Hiram Hitchcock, proprietor of the Fifth Avenue Hotel, New York city, and acted as his engineer of construction for the Mary Hitchcock Memorial Hospital, which Mr. Hitchcock recently erected near Dartmouth College. He leaves a wife, who is the daughter of Prof. C. A. Young, the astronomer, and a young son. Prof. Hitchcock was an active member of the Congregational church.

ENGINEERING SOCIETIES.

COMING TECHNICAL MEETINGS.

ENGINEERS' CLUB OF INDIANAPOLIS.
Jan. 26. Secy., C. C. Brown.
CANADIAN SOCIETY OF CIVIL ENGINEERS.
Jan. 31. Secy., C. H. McLeod, 112 Mansfield St., Montreal.
TECHNICAL SOCIETY OF THE PACIFIC COAST.
Feb. 1. Secy., O. Von Geldern, 719 Market St., San Francisco.
FRANKLIN INSTITUTE, PHILADELPHIA.
Feb. 1. "Recent Progress in Electro-Chemistry," by Prof. J. W. Richards. Secy., W. H. Wahl, 16 South Seventh St., Philadelphia.
ENGINEERS' CLUB OF PHILADELPHIA.
Feb. 2. Secy., L. F. Rondinella, 1122 Girard St.
CIVIL ENGINEERS' SOCIETY OF ST. PAUL.
Feb. 4. Secy., C. L. Annan, City Engineer's Office.
ENGINEERING SOCIETY OF WESTERN NEW YORK.
Feb. 4. Secy., Geo. R. Sikes, Buffalo, N. Y.
WESTERN SOCIETY OF ENGINEERS.
Feb. 6. Secy., Chas. J. Roney, Chicago.
ENGINEERS' CLUB OF ST. LOUIS.
Feb. 6. Secy., W. H. Bryan, Turner Block.
AMERICAN SOCIETY OF CIVIL ENGINEERS.
Feb. 6. Secy., Francis Collingwood, 127 E. 23d St., New York.
MONTANA SOCIETY OF CIVIL ENGINEERS.
Feb. 9 Secy., G. O. Foss, Helena, Mont.
WISCONSIN POLYTECHNIC SOCIETY.
Feb. 11. Secy., Geo. G. Mason, 144 8th St., Milwaukee.
ENGINEERS' CLUB OF KANSAS CITY.
Feb. 11. Secy., F. W. Tuttle, Baird Building.
CIVIL ENGINEERS' CLUB OF CLEVELAND.
Feb. 12. Secy., F. C. Osborn, 721 Hickox Building.
NORTHWESTERN SOCIETY OF ENGINEERS.
Feb. 12. Secy., D. W. McMorris, Burke Building, Seattle, Wash.
NORTHWESTERN RAILWAY CLUB.
Feb. 12. Secy., W. D. Crosman, Ryan Hotel, St. Paul.
DENVER SOCIETY OF CIVIL ENGINEERS.
Feb. 12. Secy., F. Ed. King, 36 Jacobson Block.
NEW ENGLAND RAILROAD CLUB.
Feb. 13. Secy., F. M. Curtis, P. O. Box 1576, Boston, Mass.
ENGINEERS & ARCHITECTS' CLUB OF LOUISVILLE.
Feb. 14. Secy., Jas. K. Zollinger, Norton Building.
ENGINEERING ASSOCIATION OF THE SOUTH.
Feb. 14. Secy., H. D. Ruhm, Nashville, Tenn.
ENGINEERS' CLUB OF MINNEAPOLIS.
Feb. 18. Secy., E. Nexsen, Kasota Block.
COLUMBIAN ENGINEERING SOCIETY.
Feb. 19. Secy., W. F. Hart, Washington, D. C.
WESTERN RAILWAY CLUB.
Feb. 19. Secy., W. D. Crosman, Club Room 9, Grand Pacific Hotel, Chicago.
ASSOCIATION OF ENGINEERS OF VIRGINIA.
Feb. 20. Secy., J. H. Pilcher, Roanoke, Va.
ENGINEERS' AND ARCHITECTS' ASSOCIATION OF SOUTHERN CALIFORNIA.
Feb. 20. Secy., F. Van Vleck, Los Angeles, Cal.
NEW YORK RAILROAD CLUB.
Feb. 21. Secy., John A. Hill, 256 Broadway, N. Y. City.
BOSTON SOCIETY OF CIVIL ENGINEERS.
Feb. 20. Secy., S. E. Tinkham, City Hall. Rooms, 36 Bromfield St.
ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.
Feb. 21. Secy., D. Carhart, Carnegie Library Building, Allegheny.
ENGINEERS' CLUB OF CINCINNATI.
Feb. 21. Secy., J. F. Wilson, 24 W. 4th St.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.
Feb. 27. Secy., F. R. Hutton, 12 W. 31st St., New York.
NORTHWESTERN TRACK AND BRIDGE ASSOCIATION.
March 15. Secy., D. W. Meeker, St. Paul, Minn.
CENTRAL RAILWAY CLUB.
March 27. Secy., S. W. Spear, East Buffalo Iron Works, Buffalo, N. Y.
SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.
April 18. Atlanta, Ga., Secy., F. A. Charplot, Macon, Ga.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—The fifteenth annual meeting was held at Allegheny, Pa., Jan. 18. The secretary's report showed a membership of 430, and the treasurer's report showed a balance of $325.14. Mr. Charles Davis, the retiring president, delivered an address on "Transportation." The election of officers resulted as follows: President, Thomas H. Johnson; Vice-President, Emil Swenson; Directors, Harry J. Lewis, C. Karl and F. Stahl; Treasurer, A. E. Frost; Secretary, Daniel Carhart.

ENGINEERS AND ARCHITECTS' CLUB OF LOUISVILLE.—The annual meeting was held Jan. 10, and officers were elected as follows: President, R. Montfort; Vice-President, Max Drach; Secretary, Jas. K. Zollinger.

ENGINEERS' CLUB OF CINCINNATI.—At the annual meeting, held Dec. 20, 1894, the report of the Secretary showed a net increase of nine members during the year, making the membership 124. There were 16 new members elected, 3 resignations and 1 death

during the year. Regular meetings were held each month, except July and August, at which papers were read. The election of officers for the coming year resulted as follows: President, M. D. Burke; Vice-President, Chas. A. Ewing; Directors, L. C. Fritch, C. E. Lindsay and C. H. Meeds; Secretary and Treasurer, J. F. Wilson. The retiring president read an interesting paper on "Engineering Practice."

J. F. Wilson, Secy.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—The proceedings of the annual meeting were published in our issue of Jan. 17, and in accordance with our usual custom we give herewith an abstract of the reports of the Board of Direction, the Auditor and the Treasurer, for the year ending Dec. 31, 1894. The changes in membership are shown in the following table:

	Jan. 1, 1894.			Jan. 1, 1895.			Losses.				Additions.		Totals	
	Resident.	Non-Resi.	Total.	Resident.	Non-Resi.	Total.	By transfer.	Resign.	Dropped.	Death.	Transfer.	Election.	Loss.	Gain.
Hon. Mem..	0	3	3	5	4	9	..	..	..	1	*1	..	1	1
Cor. Mem. ..	..	3	3	..	3	3	..	..	..	..	..	..	..	..
Members ..	208	964	1,172	209	980	1,189	1	11	6	15	16	47	36	53
Assoc. Mem.	37	109	146	42	144	186	4	..	..	1	‡12	33	5	45
Associates ..	21	47	68	24	49	73	..	1	1	2	..	9	4	9
Juniors	80	173	253	87	179	266	14	8	8	3	..	46	33	46
Fellows	15	32	47	12	35	47	..	..	..	1	..	1	1	1
Subscribers.	10	25	35	9	26	35	..	..	..	..	..	..	..	..
Totals	377	1,356	1,733	388	1,420	1,808	19	20	15	26	19	136	80	155

* Member. † 4 Associate and 2 Junior members. ‡ 4 Juniors.

It will be seen by the table that the net increase during the year has been 75.

The losses by death during the year number 26 and considerably exceed those in any previous year. They are as follows: One honorary member, Allan Campbell; 18 members, Sumner Homer Bodfish, Augustus William Boeke, Bernard Frank Booker, Jacob Merrill Clark, Anthony Erneste Bernhard Feind, Abraham Gottlieb, Henry Clay Jennings, William Henry Lotz, Gorham Parsons Low, Gilbert Murdoch, John Newell, Joseph Hill Paddock, Philip M. Price, Benjamin Rhodes, Samuel Lightfoot Smedley, Lucius A. Smith, Julius Hermann Striedinger, Charles Truesdell; one associate member, William Frederic Behrens; two associates, George Hervey Ely, Joseph P. Card; three juniors, Arthur Leon Giblin, William Bradford Jewett, Herbert Andrew Young, and one fellow, George Howland, Jr.

During the year $388 has been expended on the library, and 656 books, pamphlets, etc., have been added to it. The present number of books, pamphlets, etc., in the library is 18,522, an increase of 656 during the year. The work of revising the catalogue and rearranging the library, which was in progress at the date of the last annual report, has been completed, and there is now a complete card catalogue of everything in the library under both name and subject. In addition to this a list of all duplicates in the library has been compiled and classified, and sent in printed form to members, libraries, etc., that they may be sold or exchanged for other works not now in the library. They number about 2,000.

The expenditure for repairs and betterments upon the Society House has been $147.83. The rooms have been kept open for the convenience of members on Wednesday evenings throughout the year. While the present may not be a favorable time for any active movement looking towards enlarged quarters, your board would again call attention to their desirability, and express the hope that the time may not be far distant when this enterprise may be undertaken. While the present quarters have served well their purpose, they are far from being ideal in character. One of the most serious needs is a well-arranged meeting room.

Nineteen numbers of the Bulletin have been issued during the year, and 1,800 copies of each number were printed. These have contained abstracts of nearly all the papers read during the year, which were sufficiently full to satisfy, in most cases, the requirements of the press for early publication. This gives time for proper editing, before papers appear in the Transactions. Monthly numbers of the "Transactions" and "Proceedings" have been issued during the year. One of these was that for December, 1893, and contained the last of the papers from the Engineering Congress and the discussions on all the Congress papers. Of the extra copies of these papers which were published, 150 sets were handsomely bound, each in two volumes, and copies sent to all the authors of accepted papers not members of the society, and also to each society which had been formally invited to take part in the proceedings of the Congress.

The "Transactions" comprised 1,252 printed pages, with 106 plates and 192 cuts. The proceedings covered 204 pages. The total number of pages was 1,912, and the total cost of all publications amounted to $13,713, from which must be deducted $4,771.99 received from advertisements and sale of papers. A considerable increase in the expense of the publications for the year was incurred through the refusal of second-class postal rates to the society. Through the earnest efforts of this and other societies a law was passed at the last session of Congress granting these rates to all such societies, and the future saving to the society will be at the rate of over $2,000 per year.

The special committee on the society badge made a report at the annual convention in June last, recommending a design which it had prepared, and the report was accepted and the badge adopted by the society. Since that time the necessary dies have been prepared by Tiffany & Co., and the badges are now being furnished to such as desire them, 152 having already been ordered.

During the year 20 meetings were held, including the annual meeting in New York, on Jan. 16 and 17, and the annual convention at Niagara Falls, June 20 to 25. At these meeting 44 papers were read, which were discussed either orally or in writing by 210 members and others.

The Norman Medal for 1893 was awarded to Desmond FitzGerald, M. Am. Soc. C. E., for the paper on "Rainfall, Flow of Streams and Storage." The Rowland prize for 1893 was awarded to Wm. M. Black, M. Am. Soc. C. E., for the paper on "The Improvement of Harbors on the South Atlantic Coast of the United States."

At the last annual meeting a gift of $1,000 was made to the society by F. Collingwood, M. Am. Soc. C. E., as a fund the interest of which is to be awarded annually as a prize for the best paper presented during the year by a Junior. The gift was duly accepted, and a code of rules governing the award has been adopted by the Board of Direction. The award will consist of the sum of $50 in cash and an engraved certificate signed by the President and Secretary. The first award will be made at the next annual convention for the best paper by a Junior published in the "Transactions" during 1894.

Report of the Auditor.

Receipts.

Balance on hand Dec. 31 1893		$4,191.13
Entrance fees	$3,005.00	
Current dues	20,989.43	
Past dues	811.80	
Dues for year beginning Jan. 1, 1895.	4,217.25	
Sales of publications	2,194.45	
Badges	1,045.75	
Certificates of membership	105.60	
Advertisements	2,577.50	
Interest on investment bonds	1,073.89	
Compounding dues	650.00	
Fellowship fees	250.00	
Other sources	479.68	
		37,400.35
Total		$41,591.48

Disbursements.

Interest on mortgage	$800.00	
Taxes	411.70	
Stationery and printing	1,095.89	
Postage	3,790.36	
Publications	13,713.41	
Library	1,615.95	
Convention and annual meeting	1,419.14	
Janitor	720.00	
House supplies and furniture	220.12	
Fuel	166.00	
Water	17.00	
Gas	100.85	
Certificates of membership	112.90	
Badges	856.87	
Work of committees	168.00	
Safe deposit	24.00	
Norman medal and Rowland prize	124.04	
Finance and accounts	1,781.00	
Repairs and betterments, society house	147.83	
Engineering congress	1,239.05	
Current business	6,376.05	
Other expenditures	354.51	
		35,254.67
Balance		6,336.81
Total		$41,591.48

Report of the Treasurer.

Balance on hand, Dec. 31, 1893..	$4,191.13	
Receipts, Jan. 1 to Dec. 31, 1894..	37,400.35	
Payments of audited vouchers, Jan. 1 to Dec. 31, 1894		$35,254.67
Balance on hand Dec. 31, 1894, in bank and trust company and in hands of the Secretary		6,336.81
	$41,591.48	$41,591.48

Report of the Finance Committee.

	1893.	1894.
Balance on hand	$3,008.74	$4,191.13
Receipts, less engineering congress, 1893	33,496.29	37,400.35
Total	$36,505.03	$41,591.48
Balance carried forward	4,191.13	6,336.81
Capital invested	18,310.78	20,210.78

ENGINEERS' CLUB OF ST. LOUIS.—At the meeting on Jan. 16, the following program of papers and addresses for the year 1895 was submitted: Jan. 2, "Chimney Draft," E. D. Meier; Jan. 16, "River Surveys by the Transit and Stadia," J. L. Van Ornum; Feb. 6, discussion of B. L. Crosby's paper on "The St. Louis Extension of the St. L., K. & N. W. R. R.," "A System of Removing Organisms from Liquids," J. H. Curtis; Feb. 20, "The Mechanics of Soaring Flight" (a translation), E. D. Meier; March 6, "Timber Physics," J. B. Johnson; March 20, "European Engineering Schools," W. S. Chaplin; April 3, "Methods of Determining the Heating Power of Coals," J. H. Kinealy; April 17, "Vitrified Brick for Street Paving," H. A. Wheeler; May 1, "The Design of the Train House of the New Union Station at St. Louis," Geo. H. Pegram; May 15, "An Experimental Investigation of the Three Moment Theorem," M. A. Howe; June 5, "Water Towers at Laredo, Tex., and St. Charles, Mo.," Edward Flad; Sept. 18, "Maintenance of Bridges," C. Gayler; Oct. 2, "The Continuous Rail in Street Railway Service," R. McCulloch; Oct. 16, "Sewerage of Indianapolis," C. C. Brown; Nov. 6, "Chimneys and Chimney Draft," W. E. Worthen; Nov. 20, Report of Committee on Smoke Prevention; Dec. 4, Annual Meeting; Dec. 18, Installation of Officers—Address of Retiring President.

The secretary read a communication from Col. E. D. Meier, secretary of the American Boiler Manufacturers' Association, asking the co-operation of the club in the movement to secure legislative enactment in the direction of state boiler inspection, and licensing of enginemen. On vote it was ordered that the chair appoint a committee of three to consider the matter, and to meet a committee of the American Boiler Manufacturers' Association.

Mr. J. L. Van Ornum, of the Western Society of Engineers, then read a paper on "River Surveys by the Transit and Stadia," describing a method of surveying the smaller navigable streams by the use of the stadia alone for all topographical work, as well as for the location of soundings, thus dispensing with both the triangular system and the angular methods of locating soundings. The plan was particularly recommended where speed, low first cost, and reasonable accuracy, were desired, rather than extreme precision.

William H. Bryan, Sec.

IOWA SOCIETY OF CIVIL ENGINEERS.—At the annual meeting at Dubuque, Ia., Jan. 17, officers were elected as follows: President, Prof. L. Higgins, Des Moines; Vice-President, C. R. Allen, Ottumwa; Secretary and Treasurer, Seth Dean, Glenwood; Directors, E. E. Anderson, Dubuque, and William Steyh, Burlington.

ENGINEERING ASSOCIATION OF THE SOUTH.—At the meeting on Jan. 10 Mr. B. A. Wood read a paper on "The International Boundary Survey Between Mexico and the United States," giving an interesting sketch of the entire work as viewed from the American camp, and graphically describing the method, difficulties and dangers in the prosecution of the survey. Although the object of the work was merely to retrace the old line of 1853, extreme accuracy was necessary, in order that in the future the establishment of any lost monument will be an easy matter.

Herman D. Ruhm, Secy.

NEW PUBLICATIONS.

CROTON AQUEDUCT COMMISSION: Report of the President Jas. C. Duane, 1887-1895. 8vo; paper; pp. 13. Address the Commission, New York city.

This constitutes a part of the report of the Commission for the eight years since the first report was issued. President Duane's report gives a brief account of the history of the work of the Commission and a statement of the work now under way. The full report will be accompanied with maps, plans, statistics and technical details. It is expected that it will be ready for distribution in about three months.

THE STEEL CONSTRUCTION OF BUILDINGS.—By C. T. Purdy, C. E. Published by the University of Wisconsin, Madison, Wis. 8vo; paper; pp. 67. For copies address the Librarian of the University, inclosing a 2 ct. stamp.

This is a lecture delivered by Mr. Purdy before the College of Mechanics and Engineering. The author is well known to readers of this journal by his contributions to its columns, and he is fully equipped by practical experience to deal with his subject.

GAS AND ELECTRIC LIGHT COMMISSIONERS OF MASSACHUSETTS. Report for 1894. 8vo; paper; pp. 287; many tables. Address the Commissioners, Boston, Mass.

This volume presents a vast amount of matter in relation to the gas and electric lighting plants of Massachusetts. In fact, we do not know of another source of such complete information regarding so many lighting systems. The character and equipment of the several plants, with a considerable amount of information regarding their financial status, are presented in tabular form, as are also the rates charged, dividends paid, and many other interesting points.

Under recent legislation, cities and towns in Massachusetts may construct or purchase electric lighting

plants. Considerable red tape must be gone through with before this can be effected, and the report states what has been accomplished in this direction thus far.

PROCEEDINGS OF THE INTERNATIONAL ELECTRICAL CONGRESS, held at the City of Chicago, Aug. 21-26, 1893.—Published by the American Institute of Electrical Engineers. New York. 8vo; pp. 488; many diagrams and illustrations; $3.00.

This is a full history of this interesting and important congress of electricians, and a publication of the many papers presented to it by some of the foremost electrical engineers of the world. The contents of many of these papers are now well known to electricians, but every one interested in the subject must appreciate the good work of the American Institute of Electrical Engineers in presenting them in such a convenient and handsome shape for future study and reference. The space here available forbids any detailed review of the contents of the work, and a mere list of the papers presented would be of little value.

TRADE PUBLICATIONS.

THE BOILER MAKER.—Joseph T. Ryerson & Son, 18 Milwaukee Ave., Chicago, Ill. Paper; 12mo; pp. 36.

This is the January number of a monthly catalogue and price list of boilers and tanks, boiler iron, boiler heads, tubes, corrugated furnaces, etc., with tables of handy information as to weights of sheets and rivets, capacity of tanks, etc.

UNIVERSAL LEVEL TRIER. Buff & Berger, Boston, Mass. 8vo; pp. 8.

This pamphlet contains a description of a level trier for use in engineering schools, physical laboratories and observatories, the apparatus being designed for testing the sensitiveness and correctness of curvature of spirit levels used in engineers' field instruments, etc.

STEAM AND WATER SPECIALTIES. John Acton, 79 Washington St., Brooklyn, N. Y. 16mo; pp. 16; illustrated.

Among the specialties shown are the Acton steam pump governor, regulating and reducing valves, noiseless back-pressure valves, damper regulator and water separator or grease extractor.

FLEXIBLE SHAFT.—Stow Mfg. Co., Binghamton, N. Y. Paper; 8vo; pp. 32; illustrated.

The numerous applications of the Stow flexible shaft are well shown in this illustrated catalogue and price list, and a number of new appliances are included. The shaft has been described and illustrated in our issues of Aug. 11, 1892, and June 1, 1893.

DRAWING MATERIALS AND SURVEYING INSTRUMENTS.—Keuffel & Esser, 127 Fulton St., New York city. Paper; 8vo; pp. 404; illustrated; 50 cts.

This is a new and revised catalogue and price list, including practically everything that comes under the comprehensive title of drawing materials and surveying instruments. Among the calculators now on sale may be noted the Thacher machine, the Charpentier and Boucher dial calculators, and the Fuller spiral slide rule, while the Amsler integrator and Coradi integraph are for computing curves of stability, etc., being specially intended for ship designers. Surveying instruments of every kind and in numerous varieties are shown, and there are colored plates of different styles of leveling rods. The catalogue is very fully illustrated by cuts and by half-tone engravings from photographs, and includes detailed descriptions of surveyors' instruments, notes on the selection of drawing instruments, the application of verniers, etc. There are also numerous views of the various departments of the firm's manufactory and fine new store.

CALENDARS.—New York Dredging Co., World Building, New York city. Card, 7 × 9¼ ins.

Lawrence Cement Co., 1 Broadway, New York city. Card, 11 × 14 ins.

Buffalo Meter Co., 363 Washington St., Buffalo, N. Y. With representation of the Niagara water-power system. Card, 10 × 14 ins.

Pitts Agricultural Works, Buffalo, N. Y. Road rollers. Card, 6 × 8 ins.

National Meter Co., Boston, Mass. Continuous calendar, 6 × 9½ ins.

Wheeler Condenser & Engineering Co., 39 Cortlandt St., New York city. Card, 11 × 14 ins.

Smiths Falls Malleable Iron Works. Wm. H. Frost, Smith's Falls, Ont. 12 × 16 ins.

Otis Allen & Co., Lowell, Mass. Kyanised lumber. Card, 7 × 9 ins.

American Signal Co., Baltimore, Md. Highway crossing signals. Card, 7½ × 11½ ins.

Link-Belt Machinery Co., Chicago, Ill. Card, 6½ × 9½ ins., with leaf for each week.

Philadelphia Engineering Works, Philadelphia, Pa. Tables of horse-power of engines. Card, 11 × 14 ins.

Morris Machine Works, Baldwinsville, N. Y. 14 × 11 ins., with view of of Loch Awe, Scotland.

Newark Pulverizing Works, 108 Passaic St., Newark, N. J. Card, 7½ × 9½ ins.

CONSTRUCTION NEWS.

CONDENSED LIST OF CONTRACTS PENDING WITH DATE OF OPENING BIDS.

Bids to be opened.	Work.	Place.	See Eng. News.
Jan. 24.	Water-wks. materials,	Shelby, Mich.	Jan. 10
	Advertised, Eng. News, Jan. 10 and 17.		
Jan. 24.	Building materials,	Newark, N. J.	Jan. 3
	Advertised, Eng. News, Jan. 3 and 10.		
Jan. 25.	Asphalt paving,	Ottawa, Ont.	Dec. 27
Jan. 26.	Sewer bonds ($20,000),	Ilion, N. Y.	Jan. 24
Jan. 26.	Fire engines,	Toronto, Ont.	Jan. 24
Jan. 26.	Sewer bonds,	Bennington, Vt.	Jan. 17
Jan. 28.	City college building,	Baltimore, Md.	Jan. 17
Jan. 28.	Sewer materials,	Louisville, Ky.	Jan. 24
Jan. 28.	Cedar paving blocks,	Fort Wayne, Ind.	Jan. 24
Jan. 29.	Paving,	Cincinnati, O.	Jan. 10
Jan. 29.	Structures for range lights,	Boston.	Jan. 24
Jan. 29.	Electric light plant,	Wells, Minn.	Jan. 24
Jan. 29.	Pile bridge,	Denver, Colo.	Jan. 24
Jan. 29.	Street Ry. station,	Milwaukee, Wis.	Jan. 24
Jan. 29.	Electric wiring,	Milwaukee, Wis.	Jan. 24
Jan. 30.	Piles, brush and stone,	St. Louis, Mo.	Jan. 10
Jan. 30.	Sewers,	New York, N. Y.	Jan. 24
Jan. 30.	Bell,	Boston, Mass.	Jan. 24
	Advertised, Eng. News, Jan. 24.		
Jan. 30.	Flagging, etc.,	New York, N. Y.	Jan. 24
Jan. 30.	Sewer materials,	New York, N. Y.	Jan. 24
Jan. 31.	Water-wks. extensions,	New Orleans.	Jan. 10
	Advertised, Eng. News, Jan. 10 to 24.		
Jan. 31.	Building work,	Washington, D. C.	Jan. 10
	Advertised, Eng. News, Jan. 10 and 17.		
Jan. 31.	Steel bridge,	Providence, R. I.	Jan. 10
	Advertised, Eng. News, Jan. 10 and 17.		
Jan. 31.	Pier work,	New York, N. Y.	Jan. 17
Jan. 31.	Sewers,	Brooklyn, N. Y.	Jan. 24
Jan. 31.	Water-works system,	Quincy, Fla.	Jan. 24
	Advertised, Eng. News, Jan. 24.		
Feb. —.	Electric light franchise,	Staunton, Ill.	Jan. 17
Feb. 1.	Electric lighting,	Corry, Pa.	Dec. 13
Feb. 1.	Water supply,	Corry, Pa.	Dec. 13
Feb. 1.	Gas plant,	Peoria, Ill.	Dec. 27
	Advertised, Eng. News, Dec. 27.		
Feb. 1.	Electric light plant,	Peoria, Ill.	Dec. 27
	Advertised, Eng. News, Dec. 27.		
Feb. 1.	Steel swing bridge,	Port Huron, Mich.	Jan. 3
Feb. 1.	Paving,	Sandusky, O.	Jan. 10
Feb. 1.	Pipe, valves, etc.,	Cleveland, O.	Jan. 10
Feb. 1.	Water bonds ($25,000),	Ludlow, Vt.	Jan. 24
Feb. 1.	Grading,	Brooklyn, N. Y.	Jan. 24
Feb. 1.	High school building,	Luverne, Minn.	Jan. 24
Feb. 1.	Sewers,	Cincinnati, O.	Jan. 24
Feb. 1.	Viaduct approach	Milwaukee, Wis.	Jan. 24
Feb. 2.	Stone crusher,	Summit, N. J.	Jan. 24
	Advertised Eng. News, Jan. 24 and 31.		
Feb. 4.	Bridge,	Natchez, Miss.	Dec. 13
Feb. 4.	Paving bonds ($31,400),	Covington, Ky.	Jan. 3
Feb. 4.	Electric plant,	Crowley, La.	Jan. 10
Feb. 4.	Water bonds,	Duniap, Ia.	Jan. 17
Feb. 4.	Sewers,	Washington, D. C.	Jan. 17
	Advertised, Eng. News, Jan. 17 and 24.		
Feb. 4.	Dredging,	Philadelphia, Pa.	Jan. 17
Feb. 4.	Water-wks. system,	Crowley, La.	Jan. 17
Feb. 4.	Pipe sewers,	Atlanta, Ga.	Jan. 24
Feb. 4.	Stone,	Cincinnati, O.	Jan. 24
Feb. 4.	Brick paving,	Toledo, O.	Jan. 24
Feb. 4.	Water bonds,	Rochester, Mich.	Jan. 24
Feb. 4.	Brick sewers,	Atlanta, Ga.	Jan. 24
Feb. 4.	Plans for school bldg.,	Eau Claire, Wis.	Jan. 24
Feb. 5.	Water-wks. system,	Fort Plain, N. Y.	Jan. 17
	Advertised, Eng. News, Jan. 17 and 24.		
Feb. 5.	Sewer,	St. Louis, Mo.	Jan. 17
Feb. 5.	Water-wks. system,	Beaver Falls, Pa.	Jan. 17
	Advertised, Eng. News, Jan. 17 and 24.		
Feb. 5.	Pumps, filter plant, etc.,	Beaver Falls.	Jan. 17
	Advertised, Eng. News, Jan. 17 and 24.		
Feb. 5.	Pipe sewers,	Mount Vernon, Ind.	Jan. 24
Feb. 5.	Bridge,	Frankfort, Ind.	Jan. 24
Feb. 5.	Water-works system,	Waupun, Wis.	Jan. 24
Feb. 5.	Bridge masonry,	Frankfort, Ind.	Jan. 24
Feb. 6.	Water-wks. system,	Canton, Miss.	Jan. 17
Feb. 6.	Heat'g & vent'l'g app.,	St. Albans, Vt.	Jan. 17
	Advertised, Eng. News, Jan. 17 and 24.		
Feb. 6.	Iron bldg. work, etc.,	Mansfield, O.	Jan. 17
Feb. 6.	Water-works franchise,	Canton, Miss.	Jan. 24
Feb. 6.	Bridge,	Warren, O.	Jan. 24
Feb. 6.	Boiler,	Portland, Ore.	Jan. 24
Feb. 7.	Street improvements,	Avondale, O.	Jan. 17
Feb. 7.	Artesian well,	Knoxville, Ill.	Jan. 24
	Advertised, Eng. News, Jan. 24 and 31.		
Feb. 9.	Building plans,	Dallas, Tex.	Jan. 3
Feb. 9.	Water-wks. extensions,	New Orleans.	Jan. 10
	Advertised, Eng. News, Jan. 10 to 31.		
Feb. 11.	Jail,	Beaumont, Tex.	Dec. 13
Feb. 11.	Stand-pipe, etc.,	Duniap, Ia.	Jan. 17
Feb. 11.	Electric wiring,	Dallas, Tex.	Jan. 17
Feb. 12.	Water-works system,	Forest City, Ia.	Jan. 24
Feb. 13.	Dredging, etc.,	Cleveland, O.	Jan. 24
Feb. 13.	Enlarging asylum,	Waterbury, Vt.	Jan. 24
Feb. 14.	Pub. bldg. work at	New Berne, N. C.	Jan. 17
	Advertised, Eng. News, Jan. 17 and 24.		
Feb. 15.	Stone dam,	Holyoke, Mass.	Dec. 13
	Advertised, Eng. News, Dec. 13 to Jan. 24.		
Feb. 15.	Market house,	Cincinnati, O.	Jan. 24
Feb. 16.	Sewers,	Cincinnati, O.	Jan. 24
Feb. 18.	Removing boulders,	Portland, Me.	Jan. 24
	Advertised, Eng. News, Jan. 24 to Feb. 14.		
Feb. 18.	Stone,	Portland, Me.	Jan. 24
	Advertised, Eng. News, Jan. 24 to Feb. 14.		
Feb. 18.	Dredging,	Norfolk, Va.	Jan. 24
Feb. 18.	Removal of ledge,	Portland, Me.	Jan. 24
	Advertised, Eng. News, Jan. 24 to Feb. 14.		
Feb. 19.	Torpedo boats,	Washington, D. C.	Dec. 6
Feb. 19.	Hydraulic elevators,	Washington, D. C.	Jan. 24
Feb. 20.	Water bonds ($25,000),	Kamloops, B. C.	Jan. 10
Feb. 20.	Metal work,	Portland, Ore.	Jan. 17
	Advertised, Eng. News, Jan. 17.		
Feb. 20.	Asphalt paving,	Ottawa, Ont.	Jan. 17
Feb. 20.	Breaking rock,	New York, N. Y.	Jan. 24
	Advertised, Eng. News, Jan. 24 to Feb. 14.		
Feb. 20.	Snagboat,	St. Louis, Mo.	Jan. 24
	Advertised, Eng. News, Jan. 24 to Feb. 7.		
Feb. 28.	Breakwater repairs,	Duluth, Minn.	Jan. 24
Mar. 15.	Water supply,	Jersey City, N. J.	Jan. 24
May 15.	Plans, etc., for bridge,	Montreal	Jan. 24
	Advertised, Eng. News, Jan. 24 and 31.		
No date.	Railway in Arkansas (20 miles).		Jan. 17
	Advertised, Eng. News, Jan. 17.		

RAILWAYS.

East of Chicago.

BOSTON & NOVA SCOTIA COAL.—A correspondent writes as follows in regard to the contract noted last week: Messrs. Dawson, Chaplin & McCaffry have been awarded the contract for the construction and equipment of 40 miles of railway and the development of the mining areas, construction of docks, etc., by the Boston & Nova Scotia Coal Co. This work is situated in Cape Breton, N. S., where the company's mining areas are located and which contain upwards of 300,000,000 tons of bituminous coal. The railway will run from Orangedale station on the Intercolonial Ry. to the Broad Cave mines. The work will be commenced at once and will entail an expenditure of $1,500,000. The head office of contractors will be Mabou, Cape Breton, where all communications should be addressed.

ESCANABA.—A press report from Escanaba, Mich., states that D. A. Brotherton, Cy. Surv., has commenced the survey for a branch railway that is to be built from the Soo depot to that city, a distance of three miles. It is to be built and owned by local capitalists and operated by the Soo line.

INTERCOLONIAL.—The Halifax, N. S., "Herald" states that work was begun Jan. 15 on the Dartmouth branch railway, from Dartmouth to Windsor Junction, 10½ miles. The contract was let in two sections. Daniel McGregor, of Big Brook, has been awarded the contract for the Dartmouth section and Thomas Cook, of New Glasgow, has secured the Junction section.

UNION.—It is reported that the construction will soon be commenced at Homestead, Pa., on the Union Ry., which the Carnegie Steel Co. is to build between Homestead, Duquesne and Braddock, and thus bring its extensive works at the three places into close connection. The matter has been projected for a long time.

WESTERN NEW YORK & PENNSYLVANIA.—This company is reported as about to rebuild a part of its line between Rochester and Mount Morris, to eliminate a large number of bad curves.

Southern.

CHESTER & GREENVILLE.—It is stated that this company is planning to build a railway from Chester to Greenville, S. C., 65 miles. C. D. Farrar, Lockhart, S. C., is interested.

LIVE OAK, LURAVILLE & DEADMAN'S BAY.—Bids are being received, according to reports, for extending this railway from Luraville, Fla., to the Suwannee River, a distance of about two miles. Jas. R. White, Secy., Citra, Fla.

NORTHERN NECK.—The Northern Neck R. R. & Transportation Co. has been organized at Fredericksburg, Va., to build a railway from Fredericksburg down the northern neck to Millenbeck, about 90 miles. Pres., W. C. Haight, Bridgeport, Conn.; Secy., F. L. Rodgers, Bridgeport, Conn; directors, W. A. Little, Jr., and M. B. Rowe, of Fredericksburg, and Geo. B. Jones, of Richmond, Va.; Engr. in Charge, Wm. A. Hankins, of Richmond, Va.

SUGAR CREEK, PACK'S BRANCH & PAINT CREEK.—The projectors of this new coal road, incorporated in West Virginia Nov. 21, have elected the following officers: Pres., F. N. Smith, Mount Hope; Vice-Pres., Jas. F. Prince, Prince; Gen. Man., Enoch Smith, Alderson, W. Va. It is reported that the grading is now in progress.

Northwest.

CAMBRIDGE & LONDON.—A company has been organized at Cambridge, Wis., to build a branch railway from that place to London, on the Chicago & Northwestern, a distance of about three miles. An old grade will probably be used. No contracts have been awarded. Secy., H. A. Olsen, Cambridge, Wis.

TERRE HAUTE, OLNEY & CHESTER.—It is stated that the completion of the survey for this projected railway will be commenced about Feb. 1, and that there is no doubt but that the road will be built and in operation before the end of the year. It will open a territory practically without railway facilities, through Crawford, Richland, Wayne and Jefferson counties, in Illinois. Pres., John Horner, Olney, Ill.; Vice-Pres., Russell B. Harrison, Terre Haute, Ind.; Secy. and Gen. Man., F. N. Boyer, Olney, Ill.

WEYERHAUSER.—A press report from West Superior, Wis., states that the Weyerhauser logging railway, which started at White Birch in this county and has been extended north to a point near the south shore of Lake Superior, will be continued to Allouez Bay in that city. This will make the road 32 miles in length. Thirteen carloads of steel for the track, which is standard gage, are at Amnicon Junction.

Southwest.

CENTRAL LOUISIANA.—This company is reported about to commence surveys for a railway about 70 miles in length in Southern Louisiana, estimated to cost $5,000 per mile. Pres., Hamden Story, Rayne, La.

DALLAS, PACIFIC & SOCUTHEASTERN.—This railway was projected from Dallas, Tex., to Albuquerque, N. M., and about 70 miles, from Dallas to Booneville, was graded in 1890. Press reports state that the project is being revived by a company in which Governor Hogg, of Texas, is interested, and it is said to be the intention to complete it from Dallas to Grapevine this year. Dallas men have already put $210,000 in the enterprise, and are anxious to see the road completed.

LA PORTE, HOUSTON & NORTHERN.—Houston, Tex., papers state that work is to be resumed at once on the extension of this road from the present end of track southeast of Harrisburg, Tex., to La Porte, about 3 or 4 miles, and on the connection with the Houston Belt & Magnolia Park at Harrisburg. It is also proposed to build from La Porte south about 16 miles to North Galveston, to a connection with the North Galveston, Houston & Kansas City, which has been purchased and which is to be consolidated with the La Porte, Houston & Northern and Houston Belt & Magnolia Park under the name of the Galveston, La Porte & Houston. C. H. Hammett, Gen. Man., has contracted for the rails and other

materials, and the first shipment has been made. Ch. Engr., F. H. Peters, Houston, Tex.

LITTLE ROCK BRIDGE & TERMINAL.—The contracts for constructing the proposed belt line of this company, about 10 miles long, is said to have been awarded to N. S. Woods & Co., Wichita, Kan., who will begin the grading about April 1.

MISSOURI PACIFIC.—It is reported that the Missouri Pacific, Santa Fe and Rock Island railways will soon organize a company to construct a railway between Atchison, Kan., and St. Joseph, Mo. The proposed line will pass through a country which is not now reached by any road in a satisfactory manner. The construction is expected to be commenced as soon as the weather will permit.

WICHITA FALLS.—The Wichita Falls Construction Co., Wichita Falls, Tex., have awarded the following subcontracts for work on this railway: Labor, Burns & Burkitt; steel, Illinois Steel Co.; lumber, Sam Allen. Contracts for crossings, frogs, switch stands, water tanks, turntables and hand cars have not been awarded. J. H. Lyon, Gen. Man.

Rocky Mt. & Pacific.

FLORENCE SOUTHERN.—The incorporation of this company was noted last week. Several surveys of the route have been made, and one about 35 miles in length has been selected. Several of the incorporators are directors of the Florence & Cripple Creek R. R. Co., and this line will probably become part of that system. Orman & Crook, of Pueblo, Colo. are reported to have been awarded the contract for the construction, the steel rails to be made at Pueblo.

OREGON RY. & NAVIGATION.—A contract for 50,000 tamarack ties has been awarded to C. E. Averill and it is reported that a large amount of bridge materials will soon be purchased.

SALT LAKE CITY & CALIFORNIA.—R. C. Cushing, of Omaha, Neb., is in California trying to arrange for the construction of a railway from Salt Lake City to San Francisco or to Los Angeles. Mr. Cushing is a well-known railway contractor and an ex-mayor of Omaha.

UKIAH.—It is reported that Dougherty & Middletown, of Boulder Creek, Cal., have made a preliminary survey for a railway from Ukiah, Cal., into the redwood belt on the Upper Navarro.

Foreign.

MEXICAN INTERNATIONAL.—It is reported that this railway will soon be extended from Durango to the city of Mexico. The concessions for this extension were obtained some time ago.—It is stated that the contractors have a large force of men at work constructing the branch from Peata to Monterey.

MINERAL BELT.—A press report from Monterey, Mex., states as follows: The work of constructing the Mineral Belt R. R. from this city to the San Pedro mines is progressing rapidly. J. A. Robertson, Gen. Man. Monterey & Mexican Gulf Ry., and Vice-Pres. C. K. Lord and Pres. Chas. F. Meyer, of the Baltimore & Ohio Ry., are at the head of the enterprise. The company has a capital stock of $5,000,000, and it is the intention to induce many large manufacturing establishments to locate along the line of the road.

MONTEREY & MEXICAN GULF.—It is reported that the arrangements have been completed for the immediate extension of this railway from Trevino to Sierra Mojada, and thence across the Sierra Madre Mountains to the port of Mazatlan on the Pacific coast.

COSTA RICA.—A press report states that this is the first of the American republics to avail itself of the surveys of the Intercontinental Railway Commission, and has given a concession of public land to a syndicate of English capitalists for the construction of a railway from the Rio Jimenes, on the Atlantic R. R., to the Rio Frio, at the mouth of the San Juan River, on Lake Nicaragua, a distance of about 86 miles. This road will be the first link of the great chain of railways to unite the republics of North, Central and South America.

STREET AND ELECTRIC RAILWAYS.

AUGUSTA, ME.—A bill has been introduced in the house to incorporate the York County Electric R. R. Co., with a capital stock of $1,000,000, to build a railway through Kennebunkport, Lyman, Alfred, Waterboro, Newfield, Limerick, Parsonfield, Cornish, Limington, Hollis, Buxton, Saco and Biddeford.

PORTLAND, ME.—The Portland R. R. Co. is considering the question of equipping its line with electricity. Gen. Man., E. A. Newman.

GREENFIELD, MASS.—It is stated that a syndicate proposes to build an electric railway from this place to Turners Falls, by way of Cheapside and Montague City, estimated to cost $100,000. A franchise will be applied for at once. A bridge will have to be built over the Connecticut River at Montague City, estimated to cost $13,000. F. E. Lowe and E. A. Hall, Greenfield; H. T. Prince, Leominster, are interested.

HAVERHILL, MASS.—Press reports state that Mr. Barker, of Windham, is to introduce a bill in the New Hampshire legislature to incorporate the Merrimack Valley & St. Lawrence Ry. Co., and that the bill contemplates the construction of an electric railway from the state line, connecting with the Lowell, Lawrence & Haverhill system, through Nashua, Manchester, Concord, Franklin, Plymouth, and up the Merrimack valley to Canada. Thomas Sanders, Charles Corliss, E. B. Fuller and B. F. Sherburne are interested.

LAWRENCE, MASS.—The Lowell & Suburban Ry. Co. has been granted a franchise to extend its line on the east side of the Merrimack River from Dracut to Tyngsboro. The line will connect with the Nashua St. Ry. at Hudson. The line will later be extended from North Chelmsford to the Tyngsboro post office. The new line will be a link of the proposed electric railway through the Merrimack valley.

SHELBURNE FALLS, MASS.—It is reported that the cost of building an electric railway between the station here and Colrain City is to be ascertained by engineers as soon as practicable. A charter will be applied for this winter. It is evident that a steam plant will be required to develop the necessary power a portion of each year.

SOUTH NORWALK, CONN.—Press reports state that plans and specifications for the Norwalk Tramway Co.'s 100 × 40 ft. one-story brick power house on Meadow St. are completed, and work on the construction will be commenced immediately. The chimney will be 90 ft. high, and will be of steel. As soon as this building is finished, it is probable the company will prepare plans for a car barn to be erected on the same property. According to the embryo plans this building will be of iron, 100 × 40 ft., and capable of holding 20 cars. The company is considering extending its tracks to Darien, and from Rowayton through Main St. in the town line of Five Mile River.

ALBANY, N. Y.—Leslie Allen, of Altamont, and G. C. Ingraham, of Clarksville, are making surveys for a proposed electric railway from this city to Schoharie, passing through New Scotland, Thompson's Lake and Berne, a distance of 32 miles. J. W. Van Valkenburg and J. W. McNamar, Albany, are interested.

AUBURN, N. Y.—The construction of an electric railway on West Genesee St. is being discussed.

HERKIMER, N. Y.—It is stated that J. L. Hess, of Fonda, and R. T. McKever, of Gloversville, have acquired three horse railways which connect Herkimer, Mohawk, Illion and Frankfort, in Herkimer county, and that the lines will be operated by electricity.

NEW BRIGHTON, N. Y.—The Staten Island Terminal Electric Co. has been incorporated to build a line from the ferry landing at this place to form a loop about three miles in length, ending at the ferry landing, besides branches; capital stock, $50,000; Herman Bergholtz, De F. Van Vleet and F. C. Cornell, of Ithaca; Frederick Leuchten, Port Richmond; Alfred Hendricks, New York, and Grant Crabtree, New Brighton.

NEW YORK, N. Y.—The Second Ave. R. R. is reported about to be sold to a syndicate composed of J. & W. Seligman & Co., S. H. G. Stewart and Clarke, Dodge & Co., who will issue $2,000,000 in bonds to change the motive power of the system from horsepower. It is reported that the company has been investigating electric storage systems. The system includes 28 miles of single track.

WATERTOWN, N. Y.—The Watertown & Brownville St. Ry. Co. is considering extending its electric line to Dexter. Gen. Man., J. Mullin.

WILLIAMSVILLE, N. Y.—The Buffalo & Williamsville Electric Ry. Co. is to extend its line to Clarence, a distance of six miles, in the spring, according to reports. Gen. Man., J. Blocher; Ch. Engr., C. Summers.

WYNANTSKILL, N. Y.—The citizens have petitioned the Troy City Ry. Co. to extend its Albia electric line to this place, a distance of one mile. Supt., C. H. Smith, Troy.

ATLANTIC CITY, N. J.—The Brigantine Transit Co. is reported as to double track its entire electric line, which is seven miles in length.

JERSEY CITY, N. J.—The National Trolley Co. has been incorporated to construct a line between Fort Lee, Englewood and Hackensack; capital stock, $50,000; Pres., Delos Culver.

ALLENTOWN, PA.—Press reports state that the Allentown & Bethlehem Rapid Transit Co.'s electric line, which is about 20 miles in length, has been merged into the Allentown & Lehigh Valley Traction line, owned by Thos. L. Johnson and Albert L. Johnson. The combined system now reaches 19 different towns and villages, and the lines will be extended to a number of towns along the East Pennsylvania R. R. in the direction of Reading. The capital stock of the combined companies is $4,000,000.

EASTON, PA.—The Pen Argyl, Bangor & Water Gap Electric Ry. Co. has been organized with the following officers: Pres., J. C. Merrill, of Easton; Secy. and Treas., C. A. Sandt, Easton; directors, John Bitters and C. A. Sandt, Easton; Erwin Merrill, C. C. Weiss and W. F. Jordan, Bangor, and E. V. N. Heermance, of New York city. The road will be constructed in the spring, according to reports.

FLOURTOWN, PA.—Press reports state that a syndicate, representing the People's Traction Co., Philadelphia, has purchased 20 acres of ground from David McMahon, at Flourtown, on the Bethlehem turnpike, as a site for the erection of a large power house and car station for the People's Co. suburban extensions.

GETTYSBURG, PA.—The Gettysburg Electric Ry., Pres., E. M. Hoffer, has been sold to J. Luttrell Murphy, of Chicago, and Walter B. Kendall and John A. Connelly, of Philadelphia. The price paid is equivalent to $250,000. The purchasers bind themselves to complete the railway to the Maryland state line, there to connect with the Baltimore Traction Co.'s line. They are to obtain possession of the franchise on March 1, and in the meantime the present company will endeavor to settle the condemnation proceedings of the government, which are now in process in the district court at Philadelphia. The company has issued $60,000 in bonds with which to extend the line to Littlestown, a distance of 10 miles. Work will begin in the spring.

GREENSBURG, PA.—Press reports state that the Ligonier Valley R. R. Co. has decided to do away with steam cars as far as passenger traffic is concerned, and that the line will soon be fitted up for electric cars, and instead of two or three trains per day, as now, electric cars will be run from Latrobe to Ligonier every hour or oftener if occasion requires. The heavy freight will be carried over the road by steam. The line is ten miles long.

LOCK HAVEN, PA.—The Lock Haven Electric St. Ry. Co. has voted to make a number of improvements on its railway in the spring, including the extending of the line to Salona, and erecting waiting stations. Gen. Jesse Merrill is solicitor for the company.

MAYTOWN, PA.—It is reported that the Columbia & Donegal Electric Ry. Co. will extend its railway from Marietta to this place, the line to be completed this summer.

PITTSBURG, PA.—The Dravosburg & Elizabeth Electric St. Ry. Co. has been incorporated to build a line four miles in length from Dravosburg through Camden Coal Valley, Mendelsholm and Blair to Elizabeth and West Elizabeth; capital stock, $40,000; Pres., G. W. Williams, Pittsburg; directors, H. W. Juergon and H. W. Williams, Pittsburg; John Shrader, McKeesport; J. R. McQuade, Duquesne.

ROCHESTER, PA.—The Economy St. Ry. Co. has been incorporated to build a line from Beaver to Pittsburg, a distance of five miles, and to the county line of Allegheny; capital stock, $30,000; Pres., Hartford P. Brown, Rochester.

WASHINGTON, PA.—It is reported that the Washington Electric St. Ry. has been sold, and a new company has been organized which will extend the line to a number of towns and cities in this vicinity. Pres., Francis J. Torrance Treas. and Gen. Man. Standard Mfg. Co.; Thomas B. Hutchinson, A. E. Townsend and Arthur Kennedy are interested.

DOVER, DEL.—The Dover & Milford Electric Ry. Co. is about to be incorporated, with a capital stock of $500,000, to build a line from Dover to Milford, by way of Camden, Magnolia and Frederica, according to press reports.

GRAFTON, W. VA.—It is reported that a Baltimore syndicate is considering the feasibility of building a system of electric railways to connect ten of the largest towns in the central part of the state. It is estimated that 50 miles of railway can be built on county roads and reach 70,000 people.

WILMINGTON, N. C.—The Wilmington St. Ry. Co. is considering the question of extending its electric line to Oakdale and Bellevue cemeteries. Supt., M. F. Heiskell.

MISSISSIPPI CITY, MISS.—Geo. W. Pierce, Jr., has been granted a franchise for a street railway from the Gulf View Hotel to the Louisville & Nashville Ry. station.

CLEVELAND, O.—The Cleveland City Ry. Co. has decided to purchase a 1,200-HP. engine, and a 1,000-HP. generator. The contract for the generator has not yet been awarded, but the Globe Iron Wks. Co. will build the engine. The company is considering the question of extending its West Madison line to the carbon works and the St. Clair line to Nottingham. Supt., George Mulhern.

KENT, O.—Press reports state that the council opened bids on Jan. 18 for the construction of an electric railway. The Walsh-Babcock Co. declined to bid. The Sieberling Co. agreed to carry passengers in limits of Kent for five cents, to Akron for 20 cents, and to Cleveland for 60 cents. The bid was referred to a committee.

NILES, O.—The city clerk has been directed to advertise for bids for the construction and operation of the Mahoning Valley Electric St. Ry. route through this place.

PETERSBURG, O.—Z. P. Curry and H. W. Davis, Youngstown, and R. M. Hilands, Cleveland, are interested in a projected electric railway between this place and Youngstown, according to reports.

HAMMOND, IND.—The South Chicago City Ry. Co. has been granted the right of way from Roby to Hammond, by way of Burnham, and it is reported will soon ask for a franchise from the council of this place for its electric line. Supt., B. J. Jones, Chicago.

ADRIAN, MICH.—The receiver of the Adrian Electric Belt Ry. Co. has been granted permission to borrow $9,000 for new equipment.

MOUNT CLEMENS, MICH.—The St. Ry. & Dock Co. has been incorporated with a capital stock of $25,000.

CHICAGO, ILL.—Plans have been completed and petitions are in circulation to secure the right of way for an electric line from Lincoln Park through the Northwest and West Divisions south to the stock yards. The line will be built partly as a branch of the North Chicago St. R. R., and partly of the West Chicago St. R. R., the two companies furnishing the money for the construction, and each controlling a certain portion of it. Chas. T. Yerkes is interested.

SIOUX CITY, IA.—It is reported that the South Sioux City & Covington St. Ry. Co. is again figuring on an extension of its line from South Sioux City to Crystal Lake in the spring and on renting electric power from one of the companies in this city and changing the road to an electric line.

ST. LOUIS, MO.—The Missouri R. R. Co. will soon apply to the municipal assembly for a franchise to extend a branch railway from its Tower Grove Ave. line westward through Cheltenham, Clifton Heights, Benton and into St. Louis county. The proposed line covers part of the territory included in the route of the Manchester Road Electric Ry. bill, which was lately defeated in the council. Gen. Man., P. C. Moffitt.

TILLAMOOK, ORE.—The Tillamook Electric Ry., Power & Light Co. has been incorporated to build a line from the station of the Oregon Central R. R., in North Yamhill, following the course of the North Yamhill, Nestucca and Tillamook Rivers to Netarts Bay.

ELECTRIC LIGHT AND POWER.

YORK, ME.—Edward S. Marshall has petitioned for a franchise to light this place with electricity from a plant which he proposes to put in near the York Harbor & Beach Ry. station. The selectmen will hold a meeting Feb. 2 to discuss the matter.

ARCADE, N. Y.—The construction of an electric light plant is being discussed.

DOLGEVILLE, N. Y.—It is reported that the Dolgeville Electric Light & Power Co. is talking of building a dam 20 ft. high on East Canada Creek, at the high falls this summer.

LANCASTER, N. Y.—A company is being formed with a capital stock of $5,000 to put in an electric light plant, according to reports.

NIAGARA FALLS, N. Y.—The Niagara Falls Hydraulic Power & Mfg. Co. has awarded a contract to the General Electric Co., of Schenectady, for dynamos for 3,600 lights.

CAPE MAY, N. J.—Logan M. Bullitt and Thomas Robb, of Philadelphia, are interested in a projected electric light plant at this place.

LIGONIER, PA.—The construction of an electric light plant is being discussed, according to reports. L. B. Weller is interested.

PARSONS, PA.—It is proposed to put in an electric light plant, estimated to cost $8,000, according to press reports.

CAPE CHARLES, VA.—It is reported that the question of putting in an electric light plant is being agitated.

ELBERTON, GA.—An election will be held Feb. 11 to vote on the question of issuing $12,000 in bonds for an electric light plant.

ORLANDO, FLA.—The young men's business league is reported as discussing the question of granting a franchise to Mr. Robinson for an electric light plant.

BIRMINGHAM, ALA.—An electric light plant for this city, estimated to cost $200,000, is being discussed.

FULTON, KY.—It is reported that Mr. Shelton, of Searcy, Ark., has applied for a franchise for an electric light plant.

CANTON, O.—The commissioners of Stark county are considering the erection of an electric light plant, estimated to cost $20,000, for lighting the courthouse, workhouse and infirmary. The county has been paying $2,500 a year for the lighting of these buildings.

CINCINNATI, O.—The property of the Sun Vapor St. Light Co., 190 South Market St., including the operating and manufacturing plants, is to be sold at auction, Feb. 27. No bid less than $70,000 to be considered. J. A. Wann, Receiver.

MARIETTA, O.—The committee has reported in favor of advertising for bids for the purchase of the city's electric light plant and for lighting the streets for a term of ten years.

NEW COMERSTOWN, O.—It is reported that the taxpayers will soon vote on the electric light question.

KNIGHTSVILLE, IND.—An electric light plant is to be put in at this place, according to reports.

BATTLE CREEK, MICH.—The electric light plant is now operated by water power, but it is reported that a steam plant will soon be put in.

GLADSTONE, MICH.—It is reported that a committee of the council has been appointed to secure estimates of the cost of a municipal electric light plant, the present system of purchasing light having proven unsatisfactory on account of its cost.

GRAND RAPIDS, MICH.—W. J. Buckley, representing the Fort Wayne Electric Co., Fort Wayne, Ind., has submitted a proposition to the council, in which the company proposes to build an electric light plant, estimated to cost $150,000, and rent it to the city for $45,000 a year. When the rental and interest paid by the city amounts to the cost of the plant the company will then turn the entire plant over to the city and give it a deed for the plant. It is stated that a plant on this plan is operated by the company at Bloomington, Ill.

NORTHVILLE, MICH.—The Globe Furniture Co. has been awarded a contract for lighting this place by electricity at $1,038 a year.

SAGINAW, MICH.—Press reports state that a plan is under consideration by the council for establishing an electric light plant at the east side water-works, to light the streets, city hall, and other city property.

SAULT STE. MARIE, MICH.—C. B. Robinson, local manager of the Telephone & Telegraph Construction Co., is reported about to petition the council for a franchise for a new electric light company, of which he is a member, and which has a capital stock of $1,000,000.

GRAYVILLE, ILL.—William Murdack, Pres. Interstate Complete Electric Construction Co., of St. Louis, has petitioned for a franchise for an electric light plant.

MILWAUKEE, WIS.—Bids are asked until Jan. 29 for furnishing all materials and wiring the new city hall for the installation of an electric light plant. G. H. Benzenberg, Cy. Engr.

SHAWANO, WIS.—The question of putting in an electric light plant and water-works will probably be voted upon in April.

WEYAUWEGA, WIS.—The citizens will vote Jan. 28 upon the question of granting a franchise to an electric lighting company, according to reports.

DULUTH, MINN.—The Hartman General Electric Co. has awarded a contract to the E. P. Allis Co., of Milwaukee, for an engine of about 800-HP., to cost $15,000.

WELLS, MINN.—Bids are asked until Jan. 29 for constructing an electric light plant. A. O. Oleson, Cy. Recdr.; Engr., C. F. Loweth, St. Paul.

SABETHA, KAN.—It is reported that the question of electric lights is being discussed.

NEOSHO, MO.—John McElLany has organized an electric light company with a capital stock of $10,000.

NEVADA, MO.—The electric plant of the Nevada Light Co. is to be improved at once. Gen. Man., G. M. Meyers; Supt., Joseph Harper.

DALLAS, TEX.—C. L. Wakefield and L. S. Berg have been granted a franchise for an electric light plant to cost $40,000 to $60,000, and have a capacity of 120 arc and 2,000 incandescent lights; work to be commenced within 60 days.

NEW COMPANIES.—Milwaukee Dynamo Co., Milwaukee, Wis.; $15,000; W. A. Ehiman, John Koerts.

Bordeaux Dynamo Brush Co., Chicago, Ill.; $25,000; Hugo Benedix, Arthur Nolian, James J. Hock.

Great Northern Electrical Mfg. Co., St. Paul, Minn., $100,000; Henry F. Hoyt, St. Paul; R. L. Hunter, Minneapolis.

Natick Gas & Electric Co., Natick, Mass.; $125,000; Pres., Guy Wilkinson, Arthur B. Appleyard, Crayton W. Wilkinson.

Newman Canning & Electric Light Co., Newman, Ill.; $14,000; to can vegetables and operate an electric light plant; R. Thomas, Joseph Valdine, L. E. Root.

Molyneux Electric Mfg. Co., Buffalo, N. Y.; $30,000; H. Walter Webb, A. G. Leonard, New York; John P. Tribie, Barton S. Molyneux, Buffalo; Frank L. Darrow, Minneapolis.

Phillips Electric Motor Co., Paterson, N. J.; $100,000, with $2,000 paid in; to construct electric light plants and electric railways; Simeon L. Phillips, New York; Francis H. Leonard, Jr., Paterson, N. J.; Floyd B. Wilson, East Orange, N. J.

White River Water Power Co., White River, Wash.; $1,500,000, with $1,500 paid in; incorporated under the laws of New Jersey to develop for commercial purposes the water power of the White River and to erect and operate electric light and power plants; Edward H. Brush, 741 Dekalb Ave., Brooklyn, N. Y.; Thos. A.Quillam, 925 Garden St., Hoboken, N. J.; Thos. F. Brothers, Mount Pleasant Ave., West Orange, N. J.

BRIDGES.

BUZZARD'S BAY, MASS.—At the town meeting in March the question of building a $10,000 bridge will be submitted to the voters.

HAVERHILL, MASS.—It is reported that a bill will be introduced in the legislature to entirely rebuild Rocks bridge, which crosses the Merrimac River. It is stated that the reconstruction means five iron spans instead of one.

STOCKBRIDGE, MASS.—The Laurel Hill Association has awarded the contract for a concrete arch of 100 ft. span over the Housatonic River to Ice Glen to the Melan Arch Construction Co. Plans and specifications have been drawn by Fr. von Emperger, Const. Engr., 71 Broadway, New York. It will be built as soon as the season will permit and will be the largest concrete arch in this country.

CANAAN, CONN.—The North Canaan Bridge Co. has applied for a charter to build a toll-bridge across the Housatonic River between North Canaan and Salisbury.

HARTFORD, CONN.—The secretary of war has decided that the new bridge to be built to East Hartford, at a cost of $300,000, must have a draw 100 ft. wide and be completed by Oct. 1, 1895, according to press reports.

SYRACUSE, N. Y.—The council is taking steps to secure the construction of a bridge over the Erie Canal at Crouse Ave.

JERSEY CITY, N. J.—The county superintendent has prepared plans for a new bridge on Chapel Ave., and bids will soon be asked for the construction.

CONFLUENCE, PA.—The county commissioners of Fayette and Somerset counties have voted to build a new bridge at this place. It is hoped to have the bridge built this year.

SUNBURY, PA.—The Sunbury Bridge Co. was incorporated Jan. 22 to build a bridge across the Susquehanna River at this place; capital stock, $80,000, commencing with $8,000; Treas., W. H. Lyons, Sunbury.

NORFOLK, VA.—W. T. Brooke, Cy. Engr., writes us that the following bids were received Jan. 19 for two temporary pile bridges 60 and 100 ft. long respectively, and about 30 ft. wide to be replaced later by structures of steel; the council has not decided definitely to build the bridges: C. E. Culpepper, $1,465; Bunting & Boylston, $1,824; W. R. Taylor, $1,870; Sanford & Brooks, $2,550.

CHARLOTTE, N. C.—Efforts are being made to secure an issue of bonds to build a bridge over the Catawba.

ATLANTA, GA.—The Cotton States & International Exposition Co. intends to build in the grounds over "Clara Meer" a decorative concrete arch 150 ft. long. Plans from Fr. von Emperger, New York, are under consideration.

SHEFFIELD, ALA.—The Tennessee Bridge & Ferry Co. has been authorized to build a bridge across the Tennessee River at this place.

CINCINNATI, O.—The county commissioners have rejected all the bids for an iron bridge over Little Duck Creek on Columbia Ave. There were 26 received, the lowest being that of the Brackett Bridge Co. at $4,862. New plans and specifications will be prepared and the work readvertised.

CLEVELAND, O.—The Cleveland, Lorain & Wheeling R. R. Co. is reported to have awarded contracts within a month for 75 new bridges.

MARIETTA, O.—Wilkins & Davison, Pittsburg, are engineers for a proposed highway bridge across the Ohio River at this place.

WARREN, O.—Bids are asked until Feb. 6 for a bridge over Mosquito Creek; bridge to be a high-truss span 100 ft. long with a roadway 26 ft. in width and one 6-ft. walk. W. W. Wilson, Chn. County Comrs.

——The lowest bid received Jan. 15 for a three-span steel girder bridge over the Mahoning River was that of the Youngstown Bridge Co., at $6,000. The work was twice readvertised; the first time the lowest bid was $13,500, and the second time $8,170.

FRANKFORT, IND.—Bids are asked until Feb. 5 for the construction of the substructure and superstructure of an iron bridge across Prairie Creek on Washington St.; span 50 ft., width of street 80 ft. Chas. Boulden, Engr.

LAKE FOREST, ILL.—It is stated that a new bridge will be built across the university ravine, east of the gymnasium.

MOLINE, ILL.—The board of supervisors is reported about to build a bridge across the Marais d'Ozier for the residents of Cordova.

GREEN BAY, WIS.—Contracts will be let in a few days by the Kewaunee, Green Bay & Western R. R. Co. for the construction of a railway bridge across the Fox River at this place, according to reports; bridge to be 1,600 ft. long, with a draw of 90 ft., and estimated to cost $20,000.

MILWAUKEE, WIS.—Bids are asked by the board of public works until Feb. 1 for the erection of the substructure and superstructure of a side approach from Muskego Ave. to the 16th St. viaduct.

MILWAUKEE, WIS.—The city engineer has been directed to prepare estimates for a drawbridge across the river at the foot of Greenfield Ave.

DAVENPORT, IA.—Plans have been completed, according to reports, for a railway bridge and terminals for the Davenport & Rock Island Ry. Bridge & Terminal Co., to cost $600,000 to $700,000. It is stated that the contract for the construction has been awarded to Frank P. Blair, representing Eastern capitalists, the contract being conditional upon the city voting a bonus of $100,000.

TOPEKA, KAN.—A bill has been introduced in the legislature providing for the erection of a bridge across the Kansas River in this city.

OMAHA, NEB.—The clerk of the county commissioners has been directed to advertise for bids for a bridge over the Little Papillion on the southwest road.

ST. CHARLES, MO.—St. Louis parties are reported to have offered to build a highway bridge across the Missouri River at this place, to cost $300,000, if 5% interest on the bonds is guaranteed.

ASPEN, COLO.—The county surveyor has been surveying a site for a proposed bridge across Maroon Creek, about a mile below this place; estimated cost, $20,000 to $30,000.

DENVER, COLO.—Bids are asked by the board of public works until Jan. 29 for constructing a pile bent bridge, in three sections aggregating about 400 ft. in length, across Lake Archer and Platte River at 3d Ave. E. P. Martin, Ch. Engr.

SAN FRANCISCO, CAL.—Plans have been made by Howard C. Holmes, State Engr., for a footbridge to span East St., from the north line of Market St., to the union ferry depot; estimated cost, $15,000 to $18,000.

MONTREAL, QUE.—Bids are asked in our advertising columns for plans and estimates for the steel superstructure of the proposed bridge across the St. Lawrence River; 1 cantilever span of 1,250 ft., 2 side spans of 500 ft. each, 15 viaduct spans of 250 ft. each and 18 of 240 to 60 ft. each; bridge to have a double line of railway track, two lines of rails for electric street railways, a highway and two sidewalks; plans, etc., to be submitted before May 15. W. Shanley, Consult. Engr.; Robert Watson, Secy., Montreal Bridge Co., 17 St. James St.

BUILDINGS.

WATERBURY, VT.—Bids are asked until Feb. 13 for the construction of the north wing of the state insane asylum at this place. Dr. W. H. Giddings, Supt.

NARRAGANSETT PIER, R. I.—The contract for the new station for the Narragansett Pier R. R. has been awarded to Louis F. Bell, of Wakefield. The mason work has been sublet to Geo. H. Bullock. Arch., W. F. Kent, of this city.

BUFFALO, N. Y.—Press reports state that Adler & Sullivan, of Chicago, are preparing plans for a 13-story bank and office building to be erected at the southwest corner of Pearl and Church Sts., at a cost of $600,000.

NEW YORK, N. Y.—Jas. G. Wallace has purchased through Broker Geo. R. Read the property No. 38 Exchange Place and Nos. 25, 27 and 29 William St. and is reported about to erect a tall office building on the site.——John T. Williams, 54 Franklin St., is reported about to erect a $350,000 warehouse and store at 707 and 709 Broadway.

LEBANON, PA.—The council has been petitioned to take immediate steps to erect a city hall.

McKEESPORT, PA.—The Pittsburg, McKeesport & Youghiogheny R. R. Co. has plans prepared for a new $76,000 station in this city.

CINCINNATI, O.—Bids are asked by the board of administration until Feb. 15 for the erection of a new market house.

GALION, O.—Plans have been made for a new $16,000 building for the Erie shops in this city, according to reports.

CHICAGO, ILL.—Jul de Horvath is reported as preparing plans for a 120 × 170-ft. manufacturing block seven stories high and estimated to cost $200,000, to contain a power and lighting plant, and to be built on the west side, within half a mile of the city hall.

EAU CLAIRE, WIS.—Plans and specifications are asked by the board of education until Feb. 4 for a 10-room brick and stone school building to cost $20,000.

MILWAUKEE, WIS.—Bids are asked until Jan. 29 by the park commissioners for the erection and completion of a street railway station in Lake Park.

LANSING, MICH.—Bids will soon be received by the board of public works for building a fireproof stone or stone and brick city hall to cost about $100,000. There will be iron stairways, two elevators and hot blast system of heating in the building. Arch., E. A. Bowd, Lansing, Mich.

LUVERNE, MINN.—Bids are asked until Feb. 1 for the erection of a brick high school building. Arch., W. D. McLaughlin, Security Bank Bldg., Sioux City, Ia. J. A. Harboun, Clk. Bd.

NEWTON, KAN.—A bill has been introduced in the legislature authorizing Harvey county to levy a tax for a new court house.

TRINIDAD, COLO.—The Union Pacific, Denver & Gulf Ry. Co. is reported about to build a large passenger and freight depot in this city.

WATER-WORKS.

CLINTON, ME.—The Clinton Water & Electric Co. has applied for a charter to put in works and an electric light plant; capital stock, $100,000; incorporators, A. Rowell, S. P. Felker, P. B. Porter and others.

TOPSAM, ME.—Thos. W. Given, Town Clk., writes us that no steps have been taken other than to appoint a committee to investigate the question of works; probably nothing further will be done for some time; population, 1,500.

ALTON, N. H.—This town has petitioned for authority to put in works.

CASTLETON, VT.—The village has voted to build a small reservoir in the corner of Normal School Park.

LUDLOW, VT.—Bids are asked until Feb. 1 for the purchase of $25,000 of 20-year 4% water bonds. W. W. Stickney, Chn. Comrs.

BROOKFIELD, MASS.—The committee on water supply of the state senate has reported a bill authorizing this town to make an additional water loan of $50,000.

CAMBRIDGE, MASS.—The water board was granted permission to contract for the high service mains without readvertising for bids, and the contract was awarded to E. Kendall & Sons, of Cambridgeport. The work will cost about $113,000, and the bids were published in our issue of Jan. 3.

LOWELL, MASS.—The superintendent has recommended the construction of filter beds to purify 5,000,000 gallons of water a day.

MONTAGUE, MASS.—The citizens are considering the question of petitioning for a charter for a water supply district. T. F. Harrington and E. L. Bartlett are interested.

NEWBURYPORT, MASS.—The citizens have voted, 1,281 to 131, to purchase the works. The question has been under discussion for several years.

TAUNTON, MASS.—Geo. F. Chace, Superintendent, writes us that $55,000 was appropriated in December for extensions and replacing small mains with larger, and that the contract for the pipe has been awarded to the Warren Foundry & Machine Co.

TORRINGTON, CONN.—The Torrington Water Co. is about to lay a new main and make improvements requiring about 500 tons of 16 to 18-in. pipe. Chas. L. McNeil, Secy.

BUFFALO, N. Y.—The board of public works has asked the council to authorize it to advertise for bids for the construction of four new boilers at the pumping station.

CALEDONIA, N. Y.—It is stated that the question of works will soon be voted upon.

CASTLETON, N. Y.—Plans are being made for works, including a pumping station near the Hudson River and a reservoir or tower

KINDERHOOK, N. Y.—It is reported that the committee having in charge the procurement of plans and estimates for works has apparently abandoned the project.

PAWLING, N. Y.—Geo. W. Daniels, Village Clk., writes us that the Stanwix Engineering Co. of Rome has been engaged to prepare plans and supervise the construction of proposed works. Nothing else has been done at present.

POTSDAM, N. Y.—S. C. Crane, Village Clk., writes us that the committee noted in our issue of Jan. 10 has not yet submitted its report as to an additional supply, but that the intake pipe will probably be extended up the river. Chn. Com., Chas. O. Tappan.

JERSEY CITY, N. J.—Bids are asked until March 25 for a new water supply, as described more fully elsewhere in this issue. Geo. T. Bouton, Clk. Comrs.

SEA ISLE CITY, N. J.—A franchise has been granted to the Sea Isle City Electric Light, Water & Power Co., composed of Philadelphia capitalists, and it is stated that the construction of works will soon be commenced.

SUMMIT, N. J.—The new contract with the Commonwealth Water Co. requires the company to build within four months an extension of 15 ft. to the top of the stand-pipe. The company will also sink an additional well and build a reservoir.

ALLEGHENY, PA.—An election will be held Feb. 19 to vote on an issue of $400,000 in bonds for extensions.

BENTON, PA.—It it reported that a new water company will be organized by local parties who are dissatisfied with the present service.

DUQUESNE, PA.—The Duquesne Water Co. was incorporated Jan. 22; capital stock, $5,000, of which $500 is paid in; Treas. M. G. Coulin, Duquesne.

ELIZABETHTOWN, PA.—A. G. Heisey, Treas., Elizabethtown Water Co., writes us that works will not be put in before spring, at which time a complete plant, including stand-pipe, and pumps, will probably be constructed; population, 1,500.

HALIFAX, PA.—It is reported that the citizens will vote next month on an issue of $8,000 in bonds for works.

HOMESTEAD, PA.—The council has appointed a committee to arrange for a new pump at the reservoir, according to reports.

MEADVILLE, PA.—A resolution has been introduced in the council directing the city solicitor to prepare an ordinance authorizing the construction of municipal works.

NEWVILLE, PA.—The council has passed an ordinance granting a franchise for works to the Newville Water Co.

YORK HAVEN, PA.—The York Haven Water & Power Co. has been incorporated to supply water and power; capital stock, $2,000, of which $200 is paid in; Treas., Henry W. Stokes, 308 Walnut St., Philadelphia.

BALTIMORE, MD.—The Curtis Bay Light & Water Co. is reported as receiving bids for several miles of water pipe.

PRINCESS ANNE, MD.—T. H. Bock, Roger Woolford and P. M. Smith have been appointed to investigate the cost of works.

MONTMORENCI, S. C.—The Shacco Game Club is reported as contemplating the construction of works.

ATLANTA, GA.—The commissioners have petitioned for $160,837 for additional mains, increase of filter capacity and running expenses.

QUINCY, FLA.—Bids are asked by the Quincy Water-Works Co. until Jan. 31, for constructing works, as stated in our advertising columns.

TUSCUMBIA, ALA.—The Tuscumbia water-works have been purchased at auction by H. L. Armstrong, representing bondholders.

CANTON, MISS.—Bids are asked until Feb. 6 for a franchise for works, including 60 hydrants. H. W. Latimer, Clk.

NATCHEZ, MISS.—The aldermen have passed an ordinance requiring the company to procure a supply from the river. The present supply is from wells.

ROCKWOOD, TENN.—C. F. Sternwehr, Recdr., writes us that the legislature will be petitioned for authority to issue bonds for works, estimated to cost about $30,000; supply from the Tennessee River; no contracts have been let or engineer employed; population, 3,500.

HOPKINSVILLE, KY.—Press reports state that a contract has been signed with Jesse W. Starr, of New York, for the construction of works within seven months.

KUTTAWA, KY.—A contract for works is reported to have been awarded, works to include a 185,000-gallon reservoir at an elevation of 200 ft. above the town.

CADIZ, O.—The council has engaged L. E. Chapin, Canton, to prepare plans for works.

CINCINNATI, O.—The superintendent has recommended an extension of 36 and 20-in. mains, estimated to cost $4,587, to improve the supply of Mount Auburn.

LEBANON, O.—It is reported that an election was held Jan. 21 to vote on an issue of bonds for municipal works.

MARION, O.—The plant of the Scioto Water Co. will be sold at auction Feb. 20; appraised at $145,000. W. C. Haskell, Master Comr.

SABINA, O.—There is talk of putting in works to cost $12,000, according to reports.

WAPAKONETA, O.—The citizens have voted, 588 to 98, to issue bonds for works.

WELLINGTON, O.—It is reported that the project for works may be abandoned owing to the difficulty to secure a site for a reservoir.

BRIGHTWOOD, IND.—The contract for works, as advertised in Engineering News, is reported to have been awarded to the U. S. Wind Engine & Pump Co., Batavia, Ill., at $19,100.

FORT WAYNE, IND.—A contract has been awarded to the Wagner Water Supply Co. to secure an increased supply for $3,950.

MONTICELLO, IND.—There is talk of putting in works, according to reports.

ROCHESTER, MICH.—Bids are asked until Feb. 4 for the purchase of $15,000 of water bonds. John F. Jackson, Village Clk.

CHESTER, ILL.—Local papers are agitating the question of works.

CHICAGO, ILL.—The Lincoln Park Board has voted to ask for new bids for a pumping engine, the lowest one recently received being $15,993.—The county commissioners have offered to pay one-half the cost of extending the service to county institutions at Dunning, provided the total cost does not exceed $18,000.

KNOXVILLE, ILL.—Bids are asked until Feb. 7 for sinking an artesian well, as stated in our advertising columns. Consult. Engr., Chas. F. Sturtevant, St. Louis. L. M. Smith, Cy. Clk.

MOUNT OLIVE, ILL.—The citizens have voted to issue $8,000 in bonds for a reservoir.

OAKLAND, ILL.—Efforts are being made by the citizens to secure works estimated to cost $5,000.

QUINCY, ILL.—Plans for new works are reported as nearly completed. Engr., Hiram Phillips, St. Louis, Mo. W. E. Kendall, Chn. Com.

SHAWANO, WIS.—The question of works will be voted upon by the citizens in April. A. C. Weber, Cy. Clk.

WAUPUN, WIS.—Bids are asked until Feb. 5 for the construction of works. The contract for drilling an artesian well for a supply has been awarded to Gray Bros., at $2,750. R. H. Oliver, Cy. Clk.

BODE, IA.—The council is reported as in favor of calling a special election to vote on the question of works.

CENTERVILLE, IA.—It is reported that works will probably be put in.

FONDA, IA.—Bids will probably be opened before April 1 for works. M. G. Coleman, Recdr., writes us that the specifications will soon be ready and will call for a duplex pump, steel tower and tank and 7 hydrants; estimated cost, about $7,000. R. F. Beswick, Chn. Com.

FOREST CITY, IA.—Bids are asked until Feb. 12 for constructing works including 7,908 ft. of 8 to 4-in. pipe, 14 hydrants, 750,000-gallon pump, well and filtering gallery. Engr., C. F. Loweth, St. Paul. J. A. Peters, Recdr.

DULUTH, MINN.—John Clyne, of West Duluth, has submitted a proposition to build the proposed extensions to the plant for $800,000.

ELYSIAN, MINN.—C. F. Johnson, Pres. Council, writes us that the contract for works has been awarded to the U. S. Wind Engine & Pump Co., Batavia, Ill.

MINNEAPOLIS, MINN.—The committee has rejected the bids recently received for pipe. This is the second time that the bids have been rejected, the committee claiming that the companies had formed a combine against the city.

NELSON, NEB.—The citizens have voted to issue $13,000 in bonds for works.

TECUMSEH, NEB.—A committee has been appointed to investigate the different plans for increasing the water supply.

CHEROKEE, KAN.—A bill has been introduced in the legislature granting this city authority to put in works.

HANOVER, KAN.—A. A. Richardson, of Lincoln, Neb., has been engaged to prepare plans for works estimated to cost $15,000. An election has been called to vote on the question of bonds for the construction.

SABETHA, KAN.—The citizens are reported as agitating the question of works and electric lights.

RAPID CITY, S. DAK.—The Black Hills Artesian Well Co. has been incorporated by Henry E. Luke, F. S. Smith, James Woods, James Halley and J. W. Fowler; capital stock, $7,500.

GREAT FALLS, MONT.—E. W. King, Engr. Great Falls Water-Works Co., writes us that the company intends to build a reservoir 150 × 250 ft., and 20 ft. deep, at an elevation of 205 ft. above the pumping station, and connect the same with the present system by a 12 or 14-in. main 1½ miles long; also about 2½ miles of 6-in. main will be laid.

GREENFIELD, MO.—R. H. Davies, Cy. Clk., writes us that nothing definite has been accomplished as yet; population, 1,500.

NEVADA, MO.—Chas. F. Strohm, receiver, has been authorized to sink artesian wells to secure an additional supply; contracts will be awarded at once.

PINE BLUFF, ARK.—The receiver of the water company has engaged J. J. R. Croes, of New York, to examine into the condition and capabilities of the plant, and the question of the compliance of the company with the terms of its franchise.

BROWNSVILLE, TEX.—M. B. Kingsbury, Secy., writes us that the city does not contemplate putting in any works at present.

COLEMAN, TEX.—The council has voted to employ an engineer and to ask for bids for the construction of municipal works as soon as possible.

VAN HORN, TEX.—The pumping machinery belonging to the Texas & Pacific R. R. at this place was burned Jan. 10; total loss, $10,000.

WEIMAR, TEX.—We are informed that the question of works will be voted upon at the regular election in March.

COLFAX, COLO.—The town board has granted a 20-year franchise to the Denver-Highlands Water Co.

GILLETT, COLO.—The Gillett, Independence, Portland & Victor Water Co. has been incorporated to furnish water to the above named towns; capital stock, $200,000; incorporators, Edward F. Lamb, Max J. Burgdorf and Willis Moore, of Gillett.

HIGHLANDS, COLO.—Frank P. Arbuckle and others have petitioned for a franchise for the Denver-Highlands Water Co.

ASTORIA, ORE.—The following bids were received by H. G. Van Dusen, Clk. Water Comrs., Jan. 10, for constructing a complete system of works:

Pacific Paving Co., Portland, Ore.	$150,175
Risdon Ir. & Locomotive Wks., San Francisco.	157,344
Huber & Riblet, Spokane, Wash.	165,429
Wakefield & Johnson, Portland, Ore.	168,528
King & Co., Tacoma, Wash.	168,367
Bays & Jeffrey, Portland, Ore.	170,535
Porter Bros., Spokane, Wash.	171,401
Oregon Bridge Co., Portland, Ore.	177,350
Perry Hinkle, Portland, Ore.	178,216
Baker Engineering Co., Seattle, Wash.	183,648
Hoffman & Bates, Portland, Ore.	188,047

SAN DIEGO, CAL.—Edwin M. Capps, Cy. Engr., writes us that the city is now considering a proposition made by J. & U. S. Grant to furnish the city with water, and that it will probably be 30 days before the city has thoroughly investigated this proposition.

MEADFORD, ONT.—The contract for constructing works has been awarded to McQuillan & Co., at $18,262.

IRRIGATION.

GOODLAND, KAN.—The legislature has been petitioned by the citizens of Sherman county for authority to issue $30,000 in bonds for constructing irrigation ditches.

OMAHA, NEB.—The Cozard Irrigation Co. has awarded a contract to the Barnett-Record Co., of Superior, Wis., for the construction of irrigation ditches across Platte Valley, according to reports. The specifications call for a main ditch or channel to be excavated, which will be 80 ft. wide and 18 miles long, and 12 miles of lateral ditches of the same width from which the farmers of that region will be supplied with water. The work is to be completed by June 1, when the main channel will be flooded from the Platte River. The work of irrigation will be carried on extensively during the next year in Nebraska, Idaho and Colorado and possibly in the Dakotas.

PROSSER, WASH.—A. H. Dawson is interested in a scheme for irrigating about 1,000,000 acres of land in the central part of the state.

HOLLISTER, CAL.—Surveys are being made for the ditches for the San Benito Irrigation Co. It is reported that the construction will commence in April.

SAN BERNARDINO, CAL.—It is reported that the Grapeland Irrigation District is to construct about five miles of additional ditches, estimated to cost $15,000. Ch. Engr., F. C. Finkle.

NEW COMPANIES.—Union Orchard Co., Los Angeles, Cal.; $88,000, with $11,200 paid in; to deal in real estate and build water-works and distribute water for all purposes; Chas. E. Day, Horace G. Miller, J. C. Salisbury, R. C. Kirkpatrick, Walter Bordwell.

SEWERAGE.

WOODSTOCK, VT.—The village has voted to construct a system.

BOSTON, MASS.—The aldermen have passed an ordinance for the sale of $67,650 in 20-year 4% bonds for extending the system.

SALEM, MASS.—The construction of a main sewer with outlets into Salem Harbor, to accommodate Salem, Danvers and Peabody, is being discussed.

BROOKLYN, N. Y.—Bids are asked until Jan. 31 for constructing sewers in two streets. A. T. White, Comr. Cy. Wks.—The following bids were received Jan. 14 for sewers in map 8, district No. 39, Ward 26. Subdivision 2, cement pipe, lowest bidder, Edward Gorman, $38,197; highest, Charles Hart, $58,609. Subdivision 4, cement pipe, lowest, Edward Gorman, $35,175; highest, Charles Hart, $55,426. Subdivision 6, cement pipe, lowest, E. Gorman, $6,383; highest, Norton & Gorman, $8,044. Subdivision 18, cement pipe, lowest, J. F. Gillen, $13,291; highest, J. W. McSpadden, $13,942. Subdivision 21, cement pipe, lowest, Dan Creem, $21,724; highest, R. J. Mills, $23,407. Subdivision 2, vitrified pipe, lowest, Cranford & Co., $40,984; highest, $53,114. Subdivision 4, vitrified pipe, lowest, D. Creem, $36,473; highest, Charles Hart, $49,548. Subdivision 6, vitrified pipe, lowest, J. McSpadden, $6,835; highest, R. J. Mills, $8,405. Subdivision 18, vitrified pipe, lowest, J. McSpadden, $13,070; highest, R. J. Mills, $16,798. Subdivision 21, vitrified pipe, lowest, D. J. Creem, $20,930; highest, R. J. Mills, $28,004.

CHARLOTTE, N. Y.—C. A. Derr writes us that the contract for constructing a sewer system, as advertised in Engineering News, has been awarded to Ryan & Avery, Watertown, N. Y., at $13,755. A large table showing the itemized bids received will probably be published next week.

CLINTON, N. Y.—Arrangements have been made for a system, but it has not yet been decided whether to construct a complete system this spring or only part of it. John Colegrow, Cy. Clk.

GREENPORT, N. Y.—The Greenport Sewerage Co. has been incorporated with a capital stock of $4,500; directors, S. P. Hedges, G. C. Adams and Geo. N. Flack.

ILION, N. Y.—Bids are asked until Jan. 26 for the purchase of $20,000 of 4% sewer bonds. H. A. House, Treas.

MOUNT VERNON, N. Y.—John Bogart, Consult. Engr. State Bd. of Health, has made a report on the proposed sewage disposal works for this place.

NEW YORK, N. Y.—Bids are asked by the board of public works until Jan. 30 for constructing sewers in eight streets, altering sewers in two streets and for furnishing manhole heads and covers, brick, cement, sewer pipe and other materials.

MEADVILLE, PA.—Willis R. Vance, Cy. Clk., informs us that the following bids were received for building a sewage pumping station:

	Complete.	Without smoke-stack.
Kiesel & Clark, Meadville	$3,868	$1,868
Thomas McGurgan, Meadville	3,000	1,800

SCRANTON, PA.—It is proposed to construct a sewer in three wards estimated to cost $36,000.

WASHINGTON, D. C.—James McCandish has been awarded the contract for constructing a sewer in the Rock Creek Valley, at $55,910.

ATLANTA, GA.—Bids are asked until Feb. 4 for furnishing sewer pipe and brick and constructing all brick and pipe sewers to be built during the year. D. G. Wylie, Comr. Pub. Wks.

LOUISVILLE, KY.—Bids are asked by the board of public works until Jan. 28 for furnishing brick, cement, pipe and other sewer materials for the year.

CINCINNATI, O.—Bids are asked by the board of administration until Feb. 1 for constructing sewers in Van St., and until Feb. 16 for sewers in Guy St.

HAMILTON, O.—The Empire Machine Co. has been awarded the contract for the sewage pumping station, at $3,507.

LAKEWOOD, O.—The trustees are reported as to make a proposition to Cleveland to join with this place in constructing a sewer outlet into the lake on Highland Ave. The proposed sewer will drain 1,350 acres in the city and 350 acres here. It is probable that a special election will be held in Lakewood to vote on an issue of bonds for sewer and other purposes.

MOUNT VERNON, IND.—Bids are asked until Feb. 5 for constructing 12 and 15-in. pipe sewers. C. L. Prosser, Cy. Clk.

MILWAUKEE, WIS.—The board of public works has recommended an issue of $20,000 in bonds for extending the Bay View system.

WATERTOWN, WIS.—The city received 13 bids Jan. 18. The lowest bid was that of J. H. Roche, of Chicago, at about $14,250, followed closely by William Gordor, of this city; G. J. Markey, of Milwaukee; King & Co., of Duluth, and McCann & McLellan, of Ashland.

TEXARKANA, ARK.—J. F. Smith, J. W. Harris and W. A. Williams, Comrs. Improvement District No. 1, have prepared plans for sewers estimated to cost $18,886.

DENVER, COLO.—E. P. Martin, Ch. Engr. Bd. Pub. Wks., writes us that no bids were received for the disposal of the output of the Delgany St. main sewer, and that the city has now decided to construct the main out of town far enough for present needs and outlet into the river. But in construction ultimate disposal will be kept in view and the main laid upon as flat a grade as will secure scouring velocity with the present maximum daily flow.

GARBAGE DISPOSAL.

MERIDEN, CONN.—The city has paid $2,100 a year for garbage collection, but the present contractor is reported as refusing to renew the contract at this price and there is talk of making some change in the method of collection.

NEW HAVEN, CONN.—Bids for garbage collection were to be received by the board of health up to Jan. 22. One bid, at $5,000 a year, had already been submitted.

AKRON, O.—A special committee of the board of health and council is investigating the question of a garbage furnace. Chn., Dr. Fisher.

SAN BERNARDINO, CAL.—The City Garbage Co. has been organized to remove garbage, etc. Gen. Man., A. B. Smith.

STREETS AND ROADS.

CAMBRIDGE, MASS.—The superintendent of streets has been directed to purchase 86,000 paving blocks.

BROOKLYN, N. Y.—Bids are asked until Feb. 1 for grading 46th St. from Fifth Ave. to the city line. A. T. White, Comr. Cy. Wks.

NEW YORK, N.Y.—Bids are asked by the department of public works until Jan. 30 for grading three streets and flagging two streets.

SYRACUSE, N. Y.—The city clerk has been directed to advertise for bids for paving three streets with asphalt.

CHELTENHAM, PA.—The court of Cheltenham township has been petitioned to order an election to vote on a proposition of $75,000 in bonds for macadamizing.

SCOTTDALE, PA.—The citizens will vote on Feb. 19 on a proposition to issue $29,907 of 3½% street improvement bonds.

WASHINGTON, D. C.—Sawders & Houston, Pittsburg, Pa., were the only bidders for paving six squares in several alleys with asphalt or vitrified blocks on 6-in. gravel foundation. It is stated that the work will be readvertised.

MOBILE, ALA.—The Mobile Paving Co. has been incorporated with a capital stock of $5,000 by Adam Glass, A. S. Lyons and others.

BATAVIA, O.—The lowest bids received Jan. 15 for constructing 6½ miles of roads, 10 contracts, were as follows: J. B. Glancy, $950; H. B. Lanham, $950; J. G. Work (2), $900, $950; Daniel Rolander, $995; Bavis & Hurley, $600; Jas. E. Shaw, $849; A. M. Jeffries, $798; Geo. Ran, $845; Perry Rnohr, $1,965. From 7 to 16 bids were received for each contract and the lowest were reported to be much below the engineer's estimate. J. W. Davis, County Audr.

TOLEDO, O.—Bids are asked until Feb. 4 for paving Wisconsin St. with brick. L. P. Harris, Cy. Clk.

FORT WAYNE, IND.—Bids are asked until Jan. 28 for cedar blocks in two-carload lots. Willis Hattersley.

CHARLOTTE, MICH.—This town intends to build a large amount of macadam road during the coming summer. A steam road roller and stone crusher will be wanted. Address the mayor.

MUSKEGON, MICH.—It is reported that Muskegon county will issue $150,000 in bonds for building gravel roads.

WAUKEGAN, WIS.—The council has passed an ordinance for paving five blocks of the business district with brick, estimated to cost about $24,000.

DAVENPORT, IA.—It is proposed to pave portions of 10 streets at an estimated cost of $21,000.

TECUMSEH, NEB.—Johnson county proposes to improve its roads and bridges at a cost of $20,000, according to reports.

ARGENTINE, MO.—The council has passed resolutions for macadamizing several streets.

MISCELLANEOUS CONTRACTS AND SUPPLIES.

BOX CARS.—Washington, D. C.—The Southern Ry. Co. is reported as asking bids for 500 box cars.

BOILERS, ETC.—New York, N. Y.—The lowest bid received for three boilers, etc., for elevator plant at the custom house in this city was that of E. Rutzler, New York, at $3,945.

BREAKWATER REPAIRS.—Duluth, Minn.—Bids are asked until Feb. 28 for furnishing stone, etc., for repairing the breakwater at Ashland, Wis.. Maj. Clinton B. Sears, U. S. Engr. Office.

STRUCTURES FOR RANGE LIGHTS.—Boston, Mass.—Bids are asked until Jan. 29 for erecting structures for range lights at South Boston. Maj. Wm. S. Livermore, U. S. Lighthouse Engr.

BOILER.—Portland, Ore.—Bids are asked until Feb. 6 for the erection of a boiler at the light station at Port Wilson, Wash. Maj. James C. Post, U. S. Lighthouse Engr

DREDGING.—Norfolk, Va.—Bids are asked until Feb. 18 for dredging inland water way from Norfolk Harbor, Va., to Albermarle Sound, N. C. Capt. Thos. L. Casey, U. S. Engr. Office.

CARS AND LOCOMOTIVES.—Cincinnati, O.—The Cleveland, Cincinnati, Chicago & St. Louis Ry. Co. is reported as about to purchase 500 box, 500 platform and 300 coal cars, and certain locomotives.

HYDRAULIC ELEVATORS.—Washington, D. C.—Bids are asked until Feb. 19 for hydraulic elevators for the congressional library building. Bernard R. Green, Supt. and Engr.

PIPE LINE.—Los Angeles, Cal.—A franchise has been granted to the Los Angeles Pipe Line Co., recently incorporated with a capital stock of $500,000. W. B. Wilshire, J. C. Quinn and C. C. Carpenter are interested.

LOCOMOTIVES AND ORE CARS.—Duluth, Minn.—The Duluth, Missabe & Northern R. R. Co. is reported as about to purchase several heavy locomotives; also a number of ore cars.—The Duluth & Iron Range R. R. Co. is reported about to purchase 600 ore cars.

DREDGING.—Cleveland, O.—Bids are asked until Feb. 13 for city dredging and removing bars and other obstructions for five years. J. H. Farley, Dir. Pub. Wks.

FIRE ENGINES.—Toronto, Ont.—Bids are asked until Jan. 26 for one or more steam fire engines, fully equipped, capacity of from 1,000 to 1,300 gallons per minute. Thos. Foster, Chn. Fire Com.

PIERS.—Lake George, N. Y.—The Lake George Excursion Co. has been incorporated and will purchase the steamer "Mohican" and will erect piers at Caldwell and Paradise Bay. A 5,000,000-c. p. electric searchlight will be purchased for use during evening excursions. Orville Griffin, of Sandy Hill, and E. J. West, of Lake George, are interested.

MARINE RAILWAY.—Sault Ste. Marie, Mich.—James Puller is reported about to build a marine railway to handle vessels not exceeding 160 ft. in length.

SHIP CANAL.—Indianapolis, Ind.—A resolution has been introduced by Senator Haggard asking that a committee be appointed to investigate the feasibility of a ship canal to connect Lake Michigan with the Upper Tippecanoe River, thence down stream to the Wabash and by means of that river to the Ohio. The decline, it is said, will be sufficient to furnish a continuous and powerful flow of water.

STONE.—Cincinnati, O.—Bids are asked until Feb. 4 for furnishing and delivering 4,855 cu. yds. of stone for Lock No. 2, Green River, Ky. Maj. D. W. Lockwood, U. S. Engr. Office.

CANAL.—Hempstead, N. Y.—The residents of this village are talking of building a canal from Hempstead Bay to Rockville Center and thence to Hempstead. It is claimed that by widening and deepening East Rockaway Creek the cost will not exceed $200,000.

GAS PIPE LINE.—Wabash, Ind.—It is stated that contracts will be awarded next month by the Wabash Fuel Co. for drilling wells and building a second pipe line from near Swayzee, Grant county, to this city, a distance of 15 miles. Pres., T. W. King; Secy., M. H. Mendenhall.

FENDER WORK.—Tompkinsville, N. Y.—The following bids were received by Lieut.-Col. Peter C. Hains, U. S. Lighthouse Engr., Jan. 17, for erection of fender work for protection of east face of south sea wall at lighthouse depot, Staten Island:

Jacob Hanson, Perth Amboy, N. J.	*$1,200
H. M. Conklin & Co., Tompkinsville, N. Y.	1,450
David V. Howell, 202 Broadway, New York	1,557
R. P. & J. H. Staats, 29 Broadway, New York	1,675
P. Sandford Ross, 115 Hudson St., Jersey City	1,750
Snearin & Preston, 87 West 4th St., Bayonne	1,750
Thomas H. Stanley & Co., 208 Broadway, N. Y.	1,810
Frank Rinschler, Stapleton, Staten Island, N. Y.	1,900
John A. Kelly, 62 Elizabeth St., Brooklyn, N. Y.	2,387
John Cox, 15 Cornelia St., Brooklyn	2,647
Otto H. Klein, 70 Elton St., Brooklyn, N. Y.	**1,150

*Recommended for acceptance.
**Received at 2.20 p. m. and was not considered

STREET SIGNS.—Belleville, Ill.—Bids will soon be asked for placing new street signs in this city. Address with samples of signs F. W. Furnerer, Cy. Clk.

DRAINAGE CANAL.—Chicago Ill.—It is reported probable that new bids will be asked for completing Section F. F. C. Weir, of Cincinnati, the lowest bidder, petitioned for permission to withdraw his bid. The bids were published last week.

REMOVAL OF LEDGE.—Portland, Me.—Bids are asked until Feb. 18 for removal of ledge in western approach to channel to Mooseabec Bar, as stated in our advertising columns. Maj. E. P. Heap, U. S. Engr. Office.

REMOVING BOULDERS.—Portland, Me.—Bids are asked until Feb. 18 for removing boulders in Bagaduce River, Me., as stated in our advertising columns. Maj. D. P. Heap, U. S. Engr. Office.

STONE.—Portland, Me.—Bids are asked until Feb. 18 for placing stone in breakwaters at Bar Harbor, Rockland Harbor and mouth of Saco River, Me., as stated in our advertising columns. Maj. D. P. Heap, U. S. Engr. Office.

BREAKING ROCK.—New York, N. Y.—Bids are asked until Feb. 20 for breaking rock in the Raritan River, N. J., as stated in our advertising columns. Lieut.-Col. G. L. Gillespie, U. S. Engr. Office.

STONE CRUSHER AND BOILER.—Summit, N. J.—Bids are asked until Feb. 2 for new or second-hand stone crushers with boiler and engine capable of crushing 100 tons of rock in 12 hours, as stated in our advertising columns. Carrol Ph. Bassett.

BELL.—Boston, Mass.—Bids are asked until Jan. 30 for a 1,000-lb. bell, as stated in our advertising columns. Maj. Wm. R. Livermore, U. S. Lighthouse Engr.

STEAM POWER.—Galesburg, Mich.—A. K. Zinn, proprietor of the flouring mills in this city, is reported as receiving bids for equipping the same for using steam power.

SNAG BOAT.—St. Louis, Mo.—Bids are asked until Feb. 20 for replating an iron hull snag boat, as stated in our advertising columns. Maj. Chas. J. Allen, U. S. Engr. Office.

CONTRACT PRICES.

SEWERS.—Montclair, N. J.—The contract for constructing 1,008 ft. of sewer in Clinton Ave. has been awarded to Nick Cairo, the bids being as follows:

Bidder.	Pipe 8-in.	M'n H'les. Y's.	F. t'nk.		T't'l
Nick Cairo, Orange	$.38	$.07	$24.00	$30.00	$497
C. C. Arnold, Orange	.40	.40	23.00	23.00	516
J. J. Alworth, Montclair	.40	.30	25.00	24.00	518
A. L. Taylor, Bloomfield	.39	.25	30.00	30.00	523
J. F. Simpson, Montclair	.41	.51	21.50	24.50	528
J. B. Dyer, Montclair	.45	1.00	29.00	57.00	629
B. C. Hinck, Montclair	.50	.50	30.00	30.00	649

Zanesville, O.—The following bids were recently received for two sewers, (1) being the price per foot for an 18-in. pipe sewer in North Sixth St., and (2) for a 30-in. brick sewer in Greenwood Ave.; all bidders residents of Zanesville:

Bidder.	1.	2.
Otto Ebert	$1.36	$2.95
Evans & Dunsweiler	1.74	3.12
Adams Bros.	1.17	2.99
E. J. Tracy	1.30	...
Albert B. Howell	1.45	3.33

Pittsburg, Pa.—We are informed that the following bids were received Jan. 12 for the sewer work recently noted:

Bidder.	Pipe, per ft. 9-in.	15-in.	18-in.	20-in.	24-in.	Dr'ps.	Manholes.
Sloan, McIlvain & Ott Bros.*	$0.75	$1.25	$1.75	$1.85	$2.50	$50.00	$35.00
Cone Asceto	..	2.68	4.50	..	..	65.00	35.00
P. O'Donnell	..	1.40	..	1.80	2.40	60.00	30.00
Thomas Tate	.40	1.25	1.45	..	..	45.00	30.00
George F. Egan	.70	1.37	2.75	2.43	2.33	50.00	30.00
Sanders & Houston	..	1.82	3.20	2.63	..	44.00	30.00
Samuel Gamble	.45	1.24	2.50	1.90	1.75	50.00	30.00
M. Gallagher	.37	1.40	2.85	2.17	3.07	55.00	26.00
J. H. McQuade	.50	1.27	1.81	1.99	2.10	50.00	30.00
W. J. Dunn	.35	1.15	1.70	1.90	1.50	55.00	32.00
Keeling, Ridge & Co.	.65	1.75	2.00	2.05	2.25	60.00	35.00
Evan Jones	.47	1.00	1.47	1.94	2.00	50.00	25.00
Thomas Swain	.425	.98	...	...	...	56.00	28.00
R. Hallis	.75	.99	...	...	...	50.00	28.00
John Sweeney	.35	1.08	...	...	...	68.00	28.00
A. Neillie	..	1.23	...	...	...	...	30.00
John McIntyre	..	1.33	...	...	...	25.00	35.00
Cronin & O'Herron	..	1.18	...	1.52	1.84	45.00	35.00
J. Rumler	..	1.27	...	...	...	60.00	30.00
J. Anderson & Co.	..	2.00	...	2.65	...	60.00	25.00

*Allegheny, all others residents of Pittsburg.

DIKE AND DREDGING.—Philadelphia, Pa.—The following bids were received by Maj. C. W. Raymond, U. S. Engineer Office, Jan. 18, for constructing dike and dredging in Alloway Creek:

	Dike,* per lin. ft	Dredging,** per. cu. yd.	Total.
John P. Eyer, Philadelphia, Pa.	$4.68	$.30	$3,804
I. P. Hathaway & Co., Philadelphia	4.24	.37	4,232
B. F. Swerton & Son, Camden, N. J.	3.47	.19	2,561
Ira Lunt, New Castle, Del.	2.90	.27½	3,070
Joseph S. Allen, Philadelphia, Pa.	4.18	.22	3,014

*Timber work for dike, including iron work, 300 lin. ft.
**Material to be removed, 8,000 cu. yds.

REMOVING SHOALS.—Burlington, Vt.—The following bids were received by Capt. Smith S. Leach, U. S. Engineer Office, Jan. 17, for removal of shoals near Crossover Light, Saint Lawrence River, N. Y., the price being per cubic yard measured in place; approximate quantity of rock to be removed, 600 cu. yds.:

Willard Johnson, Fulton, N. Y.	$10.25
William J. Daly, Ogdensburg, N. Y.	9.00
Lynch & Hannan, Ogdensburg, N. Y.	8.49
Hingston & Woods, Buffalo, N. Y.	9.45

CAST IRON PIPE.—Columbus, O.—The following bids were received Jan. 10 for furnishing cast iron water pipe and specials for the year 1895; the prices being per ton of 2,000 lbs.; Supt., A. H. McAlpine:

Bidder.	Pipe, 4-in.	Pipe, 6-in.	Pipe, 8-in.	Specials.
Lake Shore Foundry*	$24.75	$23.75	$23.75	$55.00
Addyston Pipe & Steel Co.*	23.97	23.75	23.75	55.00
Ohio Pipe Co.**	20.00	19.00	19.50	42.50
Anniston Pipe & Fdry. Co.***	19.65	19.65	19.65	42.50

* Delivered on street. ** Delivered on street 50 cts. per ton extra. *** F. o. b. cars Columbus.

A typographical error last week credited these bids to Cleveland instead of Columbus.

Chicago, Ill.—A contract for 2,000 tons of 36 to 16-in. cast iron water pipe has been awarded to the Chattanooga Foundry & Pipe Works, Chattanooga, Tenn., at $19.16 per ton, delivered at the city pipe yards.

Taunton, Mass.—A contract for 1,215 gross tons of cast iron water pipe has been awarded to the Warren Foundry & Machine Co., New York, at $19.70 per ton, delivered in Taunton. Geo. F. Chace Supt. W. W.

Minneapolis, Minn.—The water-works committee received bids for a second time for cast iron pipe, on Jan. 7, and has since rejected them all, claiming that the companies had formed a combine. The bids received in December were published in our issue of Dec. 27. The bids received Jan. 7 were as follows, the price being per ton of 2,000 lbs. f. o. b. cars in this city:

Lake Shore Foundry	$21.24
Dennis Long & Co.	20.70
Anniston Pipe & Foundry Co., 6 and 8-in., $21,45; 10 and 12-in., $21.20; 16 and 24-in.	21.05
Chattanooga Foundry & Pipe Works	21.43
Ohio Pipe Co., 6 to 16-in., $21.43; 24-in.	21.00
Addyston Pipe & Steel Co.	20.75
Howard-Harrison Iron Co.	21.45

SEWERS.—Brooklyn, N. Y.—Bids were opened last week for constructing five sewers in Ward 29. Bids for this work were opened in October, the specifications then calling for cement pipe. The new specifications were for either cement or vitrified pipe, and the prices for cement pipe were about 10% lower than for the same work in October. The bids for the work in subdivision No. 2 were as follows, the lowest being Edward Gorman, at $38,196 for cement, and Cranford & Co., $40,984, for vitrified pipes:

Bids Received in Brooklyn, N. Y., Jan. 14, 1895, for Constructing a Sewer.

	Brick, 24-in.	Cement Pipe, 24-in.	Cement Pipe, 18-in.	Cement Pipe, 15-in.	Vitrified Pipe, 12-in.	Vitrified Pipe, 24-in.	Vitrified Pipe, 18-in.	Vitrified Pipe, 15-in.	Vitrified Pipe, 12-in.	Manholes.	Basins.	Concrete.
Chas. Hart	$3.39	$2.47½	$1.98	$1.83½	$1.43½	$2.05	$1.64	$1.51	$1.24	$34.00	$107	$5.00
R. J. Mills	3.10	2.12	1.43	1.23	.98	3.04	1.83	1.46	1.19	30.00	90	6.00
Geo. Clark	2.60	2.06	1.57	1.43	1.05	....	....	....	....	39.00	100	5.00
Cranford & Co.	2.80	2.10	1.40	1.20	.81	2.15	1.35	1.18	.78	28.00	95	5.50
Stratford & Hawkes	2.25	....	....	....	....	1.99	1.30	1.08	.84	29.00	95	4.75
J. F. Gillen	2.49	2.19	1.49	1.20	.90	....	....	....	....	28.00	94	....
Edward Gorman	....	1.91	1.21	1.11	.75	....	....	....	....	26.00	95	3.00

STONE.—San Francisco, Cal.—The following bids were received by Lieut.-Col. W. H. H. Benyaurd, U. S. Engineer Office, Jan. 4, for building a breakwater at San Luis Obispo Harbor: John Hackett, $2.37 per ton of 2,240 lbs.; J. M. Taylor, $2.03; Wm. C. Healy, $2.74; Jas. J. Searles, $2.42; Patrick O'Neil, $2.23; all bidders of San Francisco.

PILES.—Sioux City, Ia.—The following bids were received by Capt. H. F. Hodges, U. S. Engineer Office, Jan. 14, for furnishing materials and driving piles, (1) being the price per M. ft. for sawed lumber, (2) price per cubic yard for broken stone, and (3) price per lineal foot for furnishing and driving piles:

Bidder.	1.	2.	3.
H. Hall, Florence, Douglas Co.	....	....	$.48
Geo. Adgate, Sioux City, Ia.	$23.25	$1.80	.425
Goodrich & Robson, Sioux City.	18.75	1.94	.32
John W. Smith, Sioux City, Ia.	18.50	1.95	.45
F. N. Truax, St. Paul, Minn.	....	4.50	...
F. D. Haim, Jasper, Pip'st'ne Co.	....	1.80	...

*Norway pine piles, 32 cts.; white oak, 33.4 cts.

PAVING.—Pittsburg, Pa.—We are informed that the following bids were received Jan. 12 for paving in eight streets:

	Grading. cts.	Asphalt. $	Stone. $	Irreg. *	Curb. cts.	Cross. $	Masonry. *
Booth & Flinn, Ltd.	.35	2.90[1]	2.44[1]	...	.67	.60	4.50
Keeling, Ridge & Co.	.50	3.10[2]	2.75[2]	...	.75	.90	6.00
Sloan, M'Ilvain, Ott Brs.*	.30	...	2.10	1.45	.60	.65	8.00
Carson & Hutchinson	.50	...	2.75	1.45	.80	1.00	8.00
James H. McQuade	.25	...	2.19	1.23	.63	.70	3.00
Evan Jones	.38	...	3.00[3]	1.49	.69	.98	5.50
R. Hillis	.35	...	2.50	1.20	...	.75	...
K. Bracken	.22½	...	2.50[4]	.79½	.75	.90	...

*Allegheny; all others Pittsburg. [1]Asphalt, $2.90, $2.50, $2.72, $2.81, $2.80, $2.94, $2.49; block stone, $2.44, $2.89. [2]Asphalt, $3.10, $2.85, $2.55; block stone, $2.75, $2.40, $3.40. [3]Block stone, $3, $2.69, $3.69. [4]Block stone, $2.50, $3.

ASPHALT AND VITRIFIED BLOCK PAVING.—Washington, D. C.—The "Star" states that the only bid received by the district commissioners Jan. 15 for paving certain alleys with asphalt or vitrified brick or blocks on 6 ins. gravel was that of Sanders & Houston, of Pittsburg, at $1.08 per sq. yd., and that new bids will be asked for the work.

METAL MARKET PRICES.

LEAD.—New York: 3.1 to 3.15 cts. Chicago: 2.9 to 2.95 cts. St. Louis: 2.85 to 2.9 cts.

NAILS.—Pittsburg: 85 cts. for wire, and 80 cts. for cut at mill in carload lots.

BARBED WIRE.—Pittsburg: galvanized, $1.85; plain, $1.15 to $1.20, for carloads at mill.

FOUNDRY AND PIG IRON.—New York: $10.00 to $12.50. Pittsburg: $10 to $10.65. Chicago: $9.50 to $10.50.

TRACK MATERIAL.—New York: angle bars, 1.25 to 1.4 cts.; spikes, 1.45 to 1.6 cts.; track bolts, 1.8 to 1.9 cts. with square, and 1.9 to 2 cts. with hexagon nuts. Chicago: angle bars, 1.3 to 1.35 cts.; spikes, 1.6 to 1.7 cts.; track bolts, 1.9 to 2 cts., with hexagon nuts.

RAILS.—New York: $22 at eastern mills and $22.75 at tidewater; old rails, $11.50 to $12 for iron, and $10 to $10.50 for steel; steel rails fit for relaying, $14.00; light rails, $21; girder rails, $24. Pittsburg: $22 for standard sections of 45 lbs. and over; old rails, $12 for iron and $9 to $11 for steel. Chicago. $23 for standard sections; old rails, $10 to $11 for iron, and $6.50 to $9 for steel.

STRUCTURAL MATERIAL.—New York: beams, 1.3 to 1.5 cts.; channels, 1.35 to 1.5 cts.; angles, 1.2 to 1.35 cts.; tees, 1.4 to 1.6 cts.; universal mill plates, 1.2 to 1.35 cts.; steel plates, 1.25 to 1.4 cts. for tank, 1.4 to 1.45 cts. for shell, 1.5 to 1.65 cts. for flange, 1.75 to 2 cts. for ordinary firebox, 2 to 2.25 cts. for locomotive firebox. Pittsburg: beams, 1.25 to 1.3 cts.; channels, 1.25 to 1.3 cts.; angles, 1.1 to 1.2 cts.; tees, 1.35 to 1.4 cts.; universal mill plates, 1.1 to 1.2 cts.; steel plates, 1.15 to 1.25 cts. for tank, 1.3 to 1.35 cts. for shell, 1.35 to 1.4 cts. for flange, 2.5 to 3.75 for ordinary firebox, and 3.35 to 3.5 cts. for locomotive firebox. Chicago: beams, 1.45 to 1.5 cts.; channels, 1.45 to 1.5 cts.; angles, 1.3 to 1.35 cts.; tees, 1.55 to 1.6 cts.; universal plates, 1.4 to 1.45 cts.; steel plates, 1.35 to 1.4 cts. for tank, 1.5 to 2 cts. for flange, 2 to 4.5 cts. for firebox.

INDUSTRIAL NOTES.

THE ALFRED TUFTS IRON WORKS, at Algiers, La., recently destroyed by fire, are to be rebuilt.

THE UNION CAR CO., Depew, N. Y., has a contract for 150 freight cars for the Merchants' Despatch Transportation Co.

THE INDIANA CAR & FOUNDRY CO., Indianapolis, Ind., has an order for 500 stock cars of the Mather Stock Car Co.

ASPHALT DEPOSITS have been discovered near Ardmore, Ind. Ter., the outcrop being 80 to 100 ft. wide and 3 miles long.

THE HILL MACHINE CO., of Anderson, Ind., is building water-works machinery for McKeesport, Pa.; Dallas, Tex., and Tipton, Ind.

THE ONTARIO MALLEABLE IRON CO., of Oshawa, Ont., whose works were recently burned down, has decided to rebuild the works.

THE MICHIGAN PENINSULA CAR CO., of Detroit, Mich., has a contract for 150 freight cars for the Merchants' Despatch Transportation Co.

THE CRESCENT MFG. CO., of Detroit, Mich., will establish a plant at Muskegon, Mich., for the manufacture of a patent nail keg having only two staves.

THE GOODALE REFRIGERATOR CAR CO. will establish an ice house and refrigerating plant at North Platte, Neb., making that a point for re-icing its cars.

THE WEST END STREET RY. CO., of Boston, Mass., had its Columbus Ave. car station and 57 cars destroyed by fire Jan. 16, involving a loss of $100,000.

THE C. W. HUNT CO., of New York city, is putting in its system of narrow-gage track and cars for handling coal at the Lowell Bleachery & Dye Works, at Lowell, Mass.

THE AMERICAN RAILWAY ELECTRIC LIGHT CO., of Philadelphia, Pa., is to equip some mail cars with its system of car lighting, consisting of a storage battery and a dynamo driven from the car axle.

THE MECKLENBURG IRON WORKS, of Charlotte, N. C., will build a concentrating plant for treating gold ore. The plant will have a Theis chlorinator similar to the one now in operation at the Haile mine.

THE CRUCIBLE STEEL CASTING CO. has been organized at Canton, O., by Rees D. Wood, Henry Thomas and Clarence Whippy, with a capital stock of $10,000, and will erect a building 100 × 40 ft. for the manufacture of small steel castings and general steel foundry work.

THE YOUNGSTOWN BRIDGE CO., Youngstown, O., has the contract for a six-span bridge at Clarksville, Ark.; a bar mill building for the Ohio Steel Co.; a mill building 85 × 200 ft. in New York; and the South St. bridge at Warren, O., consisting of three 70-ft. girder spans.

THE CLEVELAND SHIPBUILDING CO., of Cleveland, O., has a contract for a lake steamer which is said to be the second largest on the lakes and the largest ever built at Cleveland. It will be built of steel, and will be 400 ft. long, 45 ft. beam and 28 ft. depth of hold, with a freight capacity for 5,500 tons. The cost will be about $225,000.

THE NATIONAL SWITCH & SIGNAL CO., of Easton, Pa., has a contract for furnishing signaling apparatus at the crossing of the double main track of the Chesapeake & Ohio Ry. with the Norfolk & Western R. R., at Kenova, W. Va. The company has also a contract for furnishing standard station block signals for the Chesapeake & Ohio Ry.

THE COPLAY CEMENT CO., of Coplay, Pa., has in course of erection a new addition to its cement works, as noted last week, which will make 500 barrels of Portland cement per day. This mill includes all the latest grinding and burning machinery in use in any of the Danish and German works, as well as American improvements in labor-saving appliances.

THE CINCINNATI BARBED WIRE FENCE CO., of Cincinnati, O., is enlarging its facilities for the manufacture of wire and wire nails of all description, and is adding a wing and an upper story to its main building. The lower floor of the new wing will be devoted to wire drawing machines with a capacity of 250 tons per 24 hours, and the second floor will be occupied by 50 or 60 nail machines.

THE BLOCK POLLOCK IRON CO., Commerce Building, Chicago, has purchased the West Nashville (Tenn.) Dummy Line, comprising about 8 miles of 46-lb. rails, cars, motors, right of way, etc. Mr. Louis Benjamin, Secy., advises us that it has not been definitely decided whether they will wreck the road and sell the supplies, improve and continue to operate it or sell it outright to some railway company desirous of getting an entrance into Nashville.

THE DOMINION LUMBER CO., of Boston, Mass., has purchased a tract of timber land in Nova Scotia, amounting to 800,000 acres. The company has been organized by W. A. Boland, Exchange Building, Boston, Mass.; W. T. Taft, of the Export Lumber Co., Boston, and others. The land is on the south shore, and the timber includes pine, spruce, hemlock, maple, birch and beech. The former duty of $2 on imported lumber was removed by the Wilson tariff bill.

THE WESTINGHOUSE MACHINE CO., Pittsburg, Pa., reports that its sales of Westinghouse engines during 1894 amounted to 270 engines, aggregating 37,915 HP. In the company's advertisement on p. 14 of last week's issue, the fact that this number of sales was for the year 1894, was accidentally omitted. The company will erect new shops on the land recently purchased from the East Pittsburg Improvement Co., adjoining the property of the Westinghouse Electric & Mfg. Co., at Brinton, Pa., including a main building 610 × 230 ft., a blacksmith shop and a power house.

THE FRED. M. PRESCOTT STEAM PUMP CO., Milwaukee, Wis., has been awarded the contract for a pumping plant for the Pioneer mine at Ely, Minn. It is to work under an 800-ft. lift. It has recently shipped to the Newport mine, Ironwood, Mich., a pumping plant having a capacity of 4,000 gallons per minute, equipped with an independent air-pump and condenser, and is also building a number of small fire-pumps for use in connection with mining. A 48-in. boring and drilling machine and a 48-in. planer have recently been added to the working plant of this company, and a 48-in. horizontal drill press is about to be put in.

NEW COMPANIES.—Multifuse Switch Co., Chicago, Ill.; $100,000; electrical appliances; Howard M. Carter and Edwin G. Lancaster.

H. A. Leck Bridge & Construction Co., Minneapolis, Minn.; $25,000.

Mobile Paving Co., Mobile, Ala.; $5,000; Adam Glass, A. S. Lyons and Jas. K. Glennon.

Hartford Axle Co., Dunkirk, N. Y.; $60,000; Robert J. Gross, C. D. Murray and George Wright.

Canton Brick Co., Canton, O.; $100,000; Henry S. Belden, Joseph L. Higley and A. A. Thayer.

Chicago Pneumatic Tool Co., Chicago, Ill.; J. W. Duntley, J. L. Clark and Charles B. Williams.

Baldorf Construction Co., St. Louis, Mo.; $2,000; Harry C. Baldorf, J. S. Rood and T. C. Vance.

Sweet Metallic Tie Co., Chicago, Ill.; $1,000,000; Jas. W. Wilson, J. M. Hoon and Chas. A. Underwood.

Dressel Railway Lamp Works, New York, N. Y.; $50,000; George C. Dressel and Frederick W. Dressel.

Thompson & Gray Quarry Co., St. Charles, Mo.; $10,000; J. W. Thompson, John Gray and O. J. Mailin.

Kansas Mining & Developing Co., Topeka, Kan., $25,000; Gov. Lewelling, H. C. Lindsey and F. J. Close.

Altoona Foundry & Machine Co., Altoona, Pa.; $100,000, commencing with $10,000; Treas., Theodore H. Wigton.

Kingsland Flue Scraper Co., Chicago, Ill.; $100,000; Philip S. Kingsland, R. Melvin Dodson and W. E. Slosson.

Economical Gas Governor Mfg. Co., Chicago, Ill.; $250,000; Abijah O. Cooper, F. C. Farnum and Edward L. Bradbury.

State Harrison Telephone Construction Co., Chicago, Ill.; $150,000; James H. Talbot, W. R. McLaren and J. F. Talbot.

Throop Novelty Iron Mfg. Co., Scranton, Pa.; $100,000, with $10,000 paid in; pipe, furnaces, etc.; Treas., Frank Merrifield.

Barclay Smoke Consuming & Fuel Saving Co., Chicago, Ill.; $1,250,000; Frank Barclay, A. S. Paddock and O. J. Collman.

Pennsylvania Tin Plate Co., New Kensington, Pa.; $200,000, commencing with $20,000; Julius L. Goldsmith, Pittsburg, Pa.

Consolidated Co., Portland, Me.; water-works and electric light plants and supplies; $125,000; Pres., S. L. Hersey. Secy., S. C. Fox.

Molyneux Electric Mfg. Co., Buffalo, N. Y.; $30,000; Barton S. Molyneux, Buffalo; Edgar Van Etten and H. Walter Webb, New York city.

Enterprise Pottery Co., New Brighton, Pa.; $30,000, commencing with $3,000; clay pipe, etc.; J. W. Kelly, Fred G. Barker and C. A. Barker.

American Bureau of Electrical Engineering Information & Employment, Chicago, Ill.; $1,000,000; Clinton E. Woods, Francis E. Drake and P. Molden.

Clonbrock Steam Boiler Co., Brooklyn, N. Y.; $200,000; boilers and steam fittings; M. B. Morris, Brooklyn, N. Y.; T. J. Lawler and John Harlin, New York.

Tennessee Improvement Co., Jersey City, N. J.; $100,000, commencing with $1,000; J. Herbert Potts, Jersey City, N. J.; John E. Bowles and George H. Wright, New York, N. Y.

John Chatillon & Sons, New York, N. Y.; spring balances and weighing machines; $200,000; George H. Chatillon and Edward Schaefer, New York; Louis A. Tranberg, Brooklyn, N. Y.

Massachusetts Car Co., Saco, Me.; $300,000, with $300 paid in; cars, snow plows, trucks, etc.; Pres., G. Arthur Hilton, Milton, Mass.; Treas., William G. Wheildon, Stoneham, Mass.

Crawford Wheel & Gear Co., Hagerstown, Md.; $100,000; pneumatic tire wheels for buggies, etc.; W. H. Crawford and Charles H. Carlisle, Hagerstown, Md.; L. Whimper, Brooklyn, N. Y.

United Smoke & Vapor Condensing Co., Camden, N. J.; $500,000, all subscribed; W. B. Buck, Philadelphia, Pa.; Henry L. Washburn, New York, N. Y.; Walter C. McCurdy, Riverton, N. J.

Boiler Tube Heat Developer Co., Jersey City, N. J.; $100,000, with $1,000 paid in; Charles W. Whitney, 64 Broadway, N. Y.; Lindley Murray, 183 Sixth Ave., Brooklyn, N. Y.; A. A. Rice, 130 York St., Jersey City, N. J.